

SAE Journal

Published Monthly by The Society of Automotive Engineers, Inc.

L. Ray Buckendale,
President

B. B. Bachman,
Treasurer

John A. C. Warner,
Secretary and Gen. Manager



■ SAE JOURNAL

Printed at Chilton Co., Inc.
56th & Chestnut Sts., Philadelphia

Editorial Office
29 West 39th St.
New York 18, N. Y.
Longacre 5-7174

Norman G. Shidle
Executive Editor

John C. Hollis
Business Manager

E. L. Carroll
Eastern Advertising Manager

A. J. Underwood
Western Advertising Manager
3-210 General Motors Bldg., Detroit 2
Tel: Trinity 2-0339

■ SAE HEADQUARTERS

29 West 39th St.
New York 18, N. Y.
Tel: Longacre 5-7170

■ WEST COAST BRANCH

530 West 6th St.
Los Angeles 14, Calif.
Tel: Vandike 3915
E. F. Lowe, Ass't Gen. Mgr.

■ DETROIT BRANCH

(for Technical Committee Activities)
808 New Center Bldg.
Tel: Madison 7495
R. C. Sackett, Staff Rep.

The Society is not responsible for statements
or opinions advanced in papers or discussions
at its meetings or in articles in the Journal.

Copyright 1946, Society of Automotive Engineers, Inc.

CONTENTS

AUGUST 1946

Expansion!	17
Briefed from SAE Meetings	18
SAE Coming Events	24
News of Society	25
1946-47 SAE Section Officers	30
1946 SAE National Tractor Meeting Program	32

TRANSACTIONS SECTION

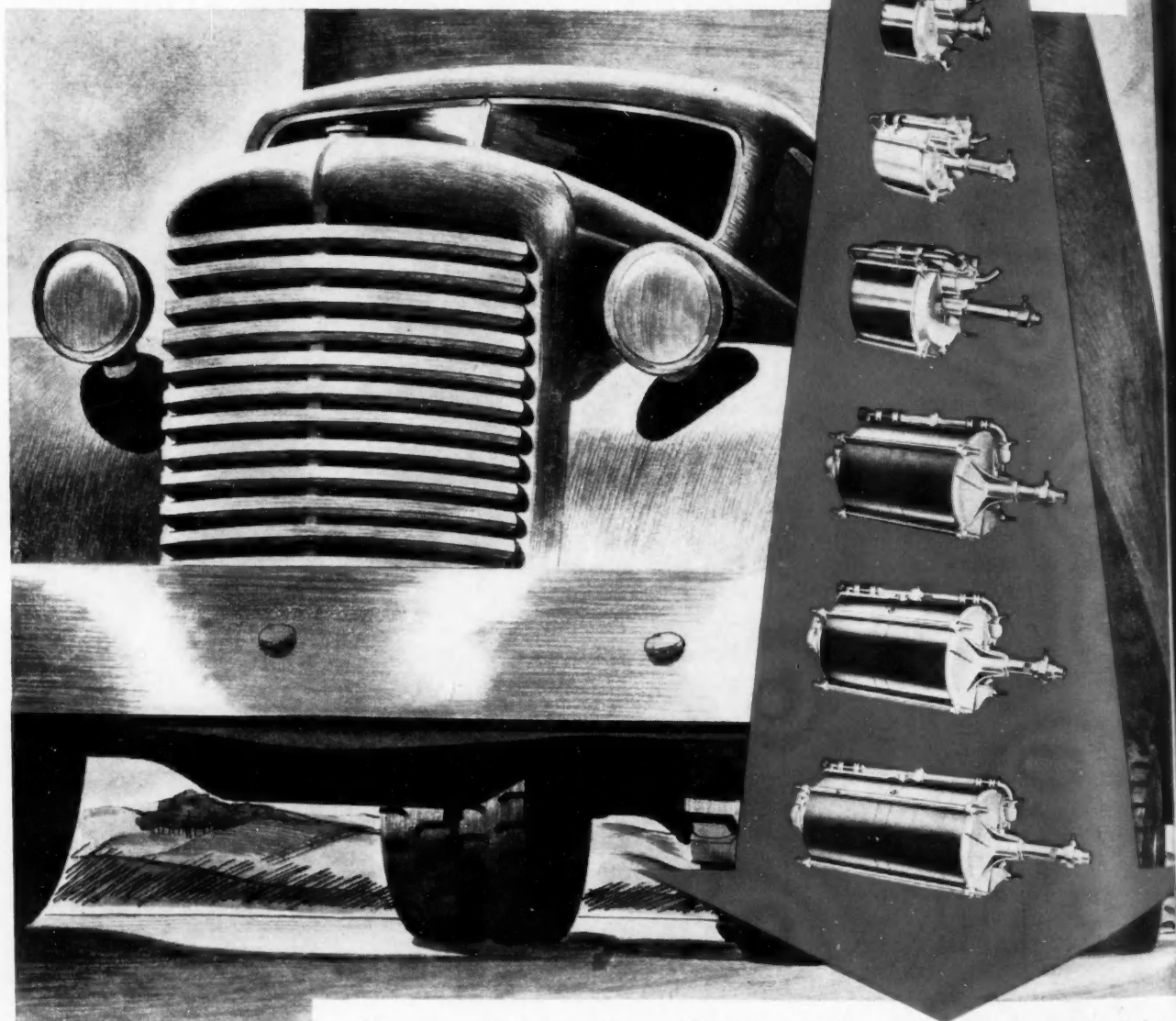
Damping in Suspensions	B. E. O'Connor	389
Development of Reference Fuel Scales for Knock Rating	Donald B. Brooks	394
German Developments in the Field of Guided Missiles	Col. D. L. Putt	404
Adhesives—Modern Tool of Fabrication	D. L. Swayze	412
German Aircraft Hydraulic Systems and Their Components	R. H. Davies	418
Significance of Cetane Number in Fuels	Com. E. F. Griep and Lt.-Com. C. S. Goddin	436
Automatic and Semiautomatic Transmissions	Harry R. Greenlee	440

1946 SAE Chicago Transportation & Maintenance Meeting Program	33
Rambling Through Section Reports	36
About SAE Members	38
SAE Student Branch News	43
New Members Qualified	44
Applications Received	45

Bendix **HYDROVAC** *1st in power braking*

Hydraulic-Vacuum Power Braking Unit

A COMPLETE LINE of hydraulic-vacuum power braking units to fit the needs of any size or type vehicle from station wagon to heavy duty truck, truck-tractor and bus.



BENDIX PRODUCTS DIVISION
Bendix Aviation Corporation
South Bend 20, Indiana



Now, power braking can be specified to fit exactly the individual needs of each model, type and size of vehicle. Because Bendix* builds a complete line of Hydrovacs,* there need be no compromise between what is required and what is available. There is a Hydrovac unit of the right type and size for the job, without costly over-power—but with ample capacity for safety and efficiency.

And remember, when you specify Hydrovac your choice is confirmed by the judgment of leading vehicle manufacturers. Proved by over a million units built and by billions of miles of service, Hydrovac is today's first choice for original factory equipment on the new model trucks and truck-tractors. For complete details write Bendix Products Division, South Bend 20, Indiana. *TRADEMARK



EXPANSION

DRAMATIC expansion of SAE publications will take place beginning next fall.

Editorial content of the *SAE Journal* will be increased and improved beginning with the October, 1946, issue. Each issue will cover a greater variety of technical subjects than ever before; better balance of technical interests will be achieved. Format and typography will be stepped up to new heights of clarity, utility, and readability.

In addition, there will be published SAE QUARTERLY TRANSACTIONS, the contents of which will supplement those of the *SAE Journal*. Nothing

in the new SAE Quarterly Transactions will be reprinted from the *SAE Journal*, whereas, in the past everything in the annual SAE Transactions has already appeared, word for word, in the Transactions Section of the *SAE Journal*. (SAE Transactions for 1946—the last of the old "reprinted-from-the-Journal" volumes—will be available in December, 1946.)

The first SAE Quarterly Transactions will appear in January, 1947. It will not carry advertising and will sell to SAE members at \$2 per year, the same price at which the old annual SAE Transactions have been available.

Varied Factors Force Vehicle Replacement

Digest of papers

by **G. W. LAURIE**
Atlantic Refining Co.

(Paper entitled "Proposal to Motor Vehicle Retirement Petroleum Distributors")

and **D. K. WILSON**
New York Power and Light Corp.

(Paper entitled "Approaches to Vehicle Retirement")

■ Annual Meeting, Jan. 8

DETERMINING factors affecting vehicle replacement, equally as important as depreciation policy, are operating conditions, maintenance procedures, mechanical condition of the vehicle, and obsolescence, agreed Mr. Laurie and Mr. Wilson in representing the viewpoints of petroleum distribution and public utility fleet operators, respectively.

Reconciling the variance in emphasis placed by each of the authors on the basic elements in retirement of automotive equipment is the fact that operational efficiency has more direct bearing upon the competitive economics of commercial fleet operation than they do upon public utility operation.

Especially is this true with regard to the depreciation aspect. Slower replacement as reflected by depreciation policy is not unnatural for a public utility since by far the largest portion of its capital investment is in durable goods; and past experience with such facilities has considerable influence upon vehicle depreciation. Mr. Laurie contended that retirement formulas based on relative depreciation as compared to maintenance costs leave much to be desired as there are too many variables affecting the depreciation period assumed.

Operating Changes Important

To prove this point, he indicated that an operating condition wherein operating points have been consolidated or the volume has grown may economically justify replacement of a number of smaller units by larger ones. Retirement of such equipment which may be of late vintage and with relatively few operating miles on the odometer becomes feasible in the face of the undeniable cost advantage; and yet, this method is in direct violation of conventional retirement formulae.

Integral considerations in the broad approach to the problem are maintenance policy and mechanical condition of the vehicle. Operators are too prone to look upon age and high mileage as conclusive indications of vehicle condemnation, Mr. Wilson pointed out. Fallacy of this logic was illustrated by Mr. Laurie in reporting that equipment in his fleet has accumulated over a million miles of travel over a period of 12 years and is just as safe today as when placed on the road in 1933. Making possible such record of high performance was an effective preventive maintenance program.

The tendency to operate equipment by running repairs only at such time that trouble occurs is costly and unwise. When gears

become noisy, when the steering wheel can literally be spun before it takes hold, when the cab is no longer presentable, the vehicle is considered worn out and should be retired. But—long before this point is reached, the equipment has ceased to be safe on the highway. It is, therefore, difficult to reconcile a "worn out" piece of equipment in the light of preventive maintenance.

Wear Standards Lacking

Nevertheless, correct evaluation of the life span of component parts has obvious significance upon economics of maintenance; and development of wear standards to serve as a yardstick for mechanical condition as a clue to retirement has only begun to scratch the surface. Too much art and not enough science characterizes vehicle maintenance today. Development of proper wear standards presents a realistic challenge to the SAE Transportation & Maintenance Activity, opined Mr. Wilson.

The last condition effecting retirement, obsolescence, may be occasioned by various conditions. In one case, change in state law increasing permissible weight of semi-tractor units from 39,000 to 45,000 lb warranted replacement of two-year-old equipment with only 250,000 accumulated miles. Other obsolescent catalysts are changes in marketing and distribution policies, highway improvement, operator's inability to obtain repair parts, and technical advancements in the automotive and petroleum industries.

For example, fuel and maintenance costs are generally the major yearly operating expenditures, and a 10 to 20% fuel mileage increase for high yearly mileage units would easily justify replacement by a more economical unit. Similarly, a better designed unit effecting an appreciable reduction in maintenance costs can also retire the more expensively maintained unit, regardless of the age of the latter.

'Ounce of Prevention' Key to Fleet Safety

Digest of paper

by **L. JOHNSON**
Colyear Motor Sales Co.

■ Spokane, Oct. 12

(Paper Entitled "Fleet Safety—Preventive Maintenance")

INSTITUTION of an effective preventive maintenance program is the key to efficient vehicle operation by fleet operators, advised Mr. Johnson. Important phases of such a program, he pointed out are:

1. Lubrication,
2. Cleanliness,
3. Inspection,
4. Adjustments, and
5. Driver instructions.

Proper and regular lubrication, whether on a mileage or hourly basis, requires proper records, skilled lubrication men, and adequate facilities including a pit and hoist, proper lighting effect, drain-oil outlet, and

pressure to all lubricant dispensaries. With regard to this most vital preventive maintenance requirement, it is well to remember a bearing company slogan of some years ago, "Oil not, neither will ye spin."

Cleanliness bears directly on all functions and operations of a vehicle, both internal and external. In addition to its relationship to lubrication, cleanliness, as an advertiser, is a potent sales asset.

The third phase, inspection, has saved its cost many times over as well as many lives. Small fleet inspection routine can be handled by the daily driver report to the shop foreman. Experience has proved that systemized inspection for large fleets requires full-time mechanical inspectors.

How important the inspection function is, Mr. Johnson proved by quoting reliable statistics revealing two out of every five cars on the road today have inefficient or defective brakes, three out of every five have defective lighting systems, and 65% of the vehicles will not pass state requirements.

Inspection of the front end, camber, caster, turning radius, frame alignment, correct wheel track, and wheel balancing play a very important part in tire wear and the whole steering mechanism. Computations indicate that for every ounce a wheel and tire is dynamically unbalanced, a 12 lb blow is received by the steering mechanism at 50 mph; in itself a safety hazard, not considering the resultant wear and tear.

Proper adjustments of certain vehicle operating units go hand in hand with systematic inspections, but adjustments that should be made between regular intervals are far more important than regular interval adjustments. It has been recognized by fleet operators that the three major adjustments are brakes, steering mechanism, and lighting equipment.

Brake Drum Adjustment

Checks on brake drum heat have revealed that where a high drum heat condition exists, contact between brake shoe and drum was improperly adjusted. This will show more where the drum has been turned and solid anchor pins used, despite proper shimming of the brake block, thereby changing the drum arc from that for the standard brake block. In this particular condition, checking the inside diameter of the drum and grinding the brake block on the shoe to the same diameter will give the proper arc and full contact from the start.

An example of the many steering mechanism adjustments having direct bearing on safety and preventive maintenance is excessive camber. This defect can directly result in abnormal tire wear, unbalanced steering, and added cost per mile. Proper camber adjustment can be made on heavy duty trucks and buses by making a bend in the axle when the truck is setting normal on the floor, which duplicates actual road conditions.

Driver training, the last phase in Mr. Johnson's five-point preventive maintenance program, covers many problems in connection with safety. With new men employed for driving heavy duty equipment at faster highway speeds, many organizations are finding it good business to set up driver training schools covering subjects on driver courtesy, rules of the road, and vehicle. These programs pay dividends in reducing accidents and minimizing operational abuse of vehicles.

Rigid Airship Competes For Long Range Hauling

Digest of Paper

by KARL ARNSTEIN
Goodyear Aircraft Corp.

Wichita, March 14

(Paper entitled "Rigid Airships")

COMMERCIAL long range transportation using the rigid airship is predicted by Mr. Arnstein for the near future. He supports his contention with the revelation that the large rigid airship is capable of carrying large and bulky cargo at attractive rates, offers passenger accommodations comparable to the ocean liner, and comfort unsurpassed by either steamer or airplane.

While the rigid airship offers the ideal combination of speed and comfort with today's design, it will be possible to give even more efficient and satisfactory service with tomorrow's design.

The commercial airship of today is being designed with deluxe stateroom accommodations for 112 passengers and a luxurious dining room accommodating 60 passengers at a time. A total of 232 passengers can be provided for in this same ship with Pullman type compartments and, using reclining chairs similar to those on domestic airlines, 288 passengers can be accommodated.

An analysis comparing the cost-per-ton-mile of operation of the large airship, the Mars flying boat, and two land planes, as shown in Fig. 1, reveals the great economic advantage of the airship over the airplane as well as the much greater range available with the airship.

Whereas cruising speeds of 75 mph are available with the present day airship, Mr. Arnstein foresees cruising speeds of 100 mph in tomorrow's airship through improvements and refinements in design. Stern propulsion, successfully used on surface ships and submarines, is one of the new features he considers adaptable to the airship. The nearly perfect symmetrical shape of the wake behind an airship body is particularly well suited for an efficient stern propulsion system. Estimates of the economies to be obtained with such a system more than compensate for the accompanying increased structural weight.

Further reduction of the total drag appears

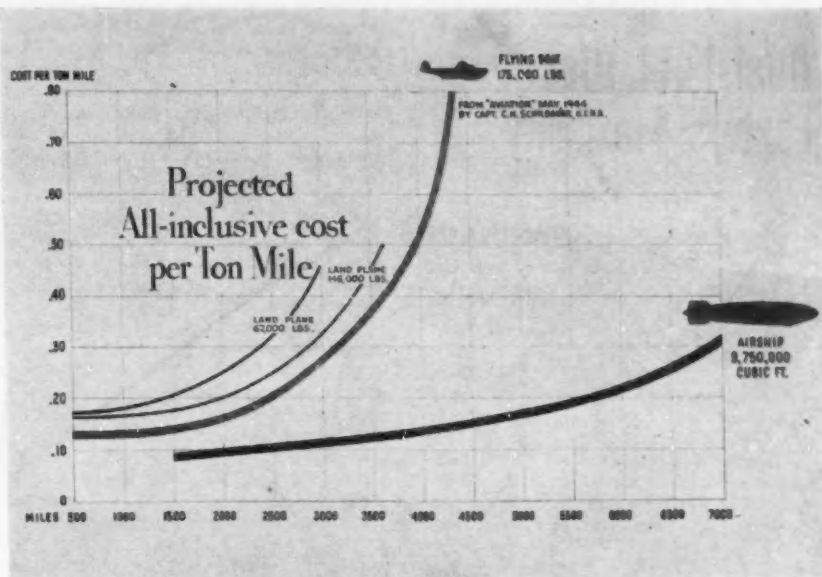


Fig. 1 - Comparison of the cost-per-ton-mile of operation of the large rigid airship with the Mars flying boat and two land planes. This chart reveals the economic advantage of the airship over the airplane as well as the much greater range available

possible utilizing low drag or laminar drag profiles for the tail surfaces, bow elevators, and even the bow of the hull. Preliminary experiments also indicate that airships can increase the payload by taking off and becoming airborne with an appreciable amount of superheat.

Just as important to the progress of the airship as the above features are the trends in engineering aspects of airship design. Stress analysis theory and calculations in the past were substantiated by measurements of stress in flight. This was not satisfactory since it required many observers to record simultaneous readings.

Developed by Goodyear engineers, a new structural element now permits an accurate means for duplicating the elastic behavior of a complicated full scale structure by using scaled models. It consists of two Z-shaped members, Fig. 2, connected at the ends by joint blocks and composed of slotted tubes connected by a central crosspiece. Proper axial stiffness is obtained by regulating the height of the central crosspiece. Strains in the girder during tests are measured optically by the rotations of four small mirrors attached to the joints and crosspieces.

Another piece of equipment developed

provides structural engineers with an essential tool required to determine these factors in the study of fatigue problems:

- The fatigue characteristics of any part of an aircraft structure, and
- The magnitude and quantity of loading variations to be considered in design.

The fatigue testing equipment consists of a resonance type machine particularly suited for testing structural members such as girders, tubes, and spars, under axial or alternating loads at rates ranging from 2400 to 6000 cycles per min.

The machine itself consists of two heavy masses connected to each other by means of a test specimen arrangement and a solenoid motor and control which maintains forced vibrations in resonance with the fundamental frequency of the specimen-mass system. The frequency can be controlled by varying the masses and the length or stiffness of the specimen arrangement.

Amplitude of vibration is held to any desired magnitude by the electric control and power input. The imposed range of stress within the specimen can be visually observed by means of a cathode ray oscilloscope. Alternating loads can be superimposed on a test specimen having any desired initial stress.

One of the studies made with this machine revealed that the fatigue strength of girders of high-strength aluminum alloy can be approximated by the 30% line of bare 24SRT material on an S-N curve. Fatigue characteristics of joining methods explored with this equipment have shown the superiority of metal in joints where greater resistance to fatigue is required.

There is definite usefulness for the rigid airship transport and depriving society of the benefit of this type of transportation would be an injustice, Mr. Arnstein concludes. Not only has this country the operational experience and scientific knowledge, but it is in the unique position of being the only country that owns all the materials required to build safe rigid airships.

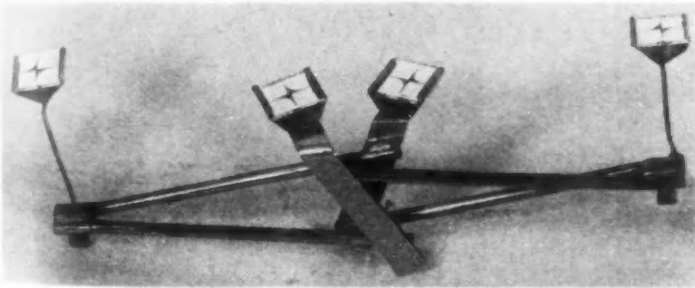


Fig. 2 - This device provides an accurate means for duplicating the elastic behavior of a complicated full scale model, such as an airship, by using scale models instead of making measurements in flights

Dual-Fuel Diesel Fosters Flexibility

Digest of paper

by IVAN NASH

Joshua Hendy Iron Co.

■ So. California, May 17

(Paper entitled "Development and Application of the Gas-Diesel")

ANNOUNCEMENT of engines that burn gaseous fuel—natural or manufactured gas—or diesel oil, changing from one fuel to the other automatically or by hand control, aroused wide spread interest. These engines, as described by Mr. Nash, are known as "Dual Fuel" or "Gas-Diesel" engines.

Until a few years ago, when burning gas as an engine fuel, engineers considered it necessary to compress the gas-air mixture to a point below its self-ignition temperature, then igniting the charge with an electric spark. This process is now performed commercially in gas-diesel engines by two other methods: (1) by compressing air as in a diesel and introducing gas at a higher pressure, and (2), by compressing a lean mixture of gas and air to diesel engine pressure and igniting it by proper means.

Operationally, the gas-diesel injects the gas in the same manner that oil is injected. Gas, however, does not ignite as readily as oil because its delay period before burning starts is much greater and tends to be irregular. This leads to irregular engine operation, most effectively remedied by injecting a small amount of oil with the gas. The oil ignites first to initiate the combustion of the gas at a definite point in the cycle, providing a smooth-running engine.

The quantity of oil, known as "Pilot Oil," is small and remains constant over the engine load range. Variations in load are achieved by varying the quantity of gas. Regulation of the quantity of gas is accomplished by varying the lift of the injection valve.

It might seem that an engine compressing gas and air to the relatively high pressure of the diesel engine would be troubled with pre-ignition. Generally overlooked, however, is the fact that the diesel engine intake is not throttled by a carburetor valve as is the gasoline engine. This means that the A/F ratio is always high, or that the mixture is lean. The secret of the gas-diesel development lies in the lean gas and air mixture which will not ignite at the usual temperatures developed by diesel engine compression.

Mixtures of a combustible and air have definite rich and lean limits beyond which combustion will not occur for given conditions of temperature and pressure. But quite lean mixtures can be burned if a considerable amount of heat is added more rapidly than it can be lost to the surrounding parts. This additional heat is supplied by the pilot oil which ignites and burns as in the conventional diesel engine. Loads at least equal to normal rated loads with oil can be carried without difficulty and some overload is usually possible before pre-ignition or detonation.

Gas is introduced into the intake manifold

at the cylinder head rather than through a mixing valve at the entrance to the intake manifold. In one device, a separate passage in the head communicates with the intake passage through an intake around the intake valve stem. The intake valve has a small disc which opens when the intake valve is partly open and connects with a separate manifold supplying the gas. An advantage of this configuration is the prevention of gas entering the intake manifold until the exhaust valve is closed during the overlap period, to avoid blowout through the exhaust valve.

The governor is connected to the injection pump by a collapsible link, so that by changing the fuel stop position and shutting off the gas supply the engine will operate as a straight diesel. Governor controls can also be arranged so that the first half of the governor travel controls gas and allows pilot oil delivery and the second half of the governor travel controls oil. The engine operates as a full diesel for starting or if the gas is shut off.

Best net consumption of the gas-diesel, based on bhp at full load, is about 7000 Btu per hp-hr. This increases with decreasing load. Full load consumption is about the same as for the straight diesel, but is greater at part load. Burning gas in the gas-diesel gives 20-25% higher efficiency than burning it in an Otto cycle spark-ignition engine. It is particularly noteworthy that natural gas, manufactured gas, sewerage gas, and others have been used as fuels

without making it necessary to derate the engine. This covers a range of heat content of about 1100 to 500 Btu per cu ft.

Both the supercharged and 2-cycle gas-diesel are practical too. Where air is compressed and the gas injected at high pressure, the arrangement described applies equally well to 4-cycle with atmospheric intake, to 4-cycle supercharged, and to 2-cycle engines. Some means for timing admission of the gas must be provided for the engine that compresses the gas and air mixture.

Under certain conditions the gas-diesel has important advantages over either the gas engine or diesel. Where there is a limited amount of by-product gas, the installation can be planned to serve a given power requirement; and when gas fuel is inadequate, the remainder can be made up with oil. Availability of by-product gas in oil refineries makes gas-diesel application for driving generators, pumps as in pipeline pumping stations, and installation on drilling rigs particularly effective.

Another instance of economies made possible through gas-diesel utilization is in localities where the demand for gas varies seasonally and is offered at special rates only when the demand is low. In such cases, oil may be the cheaper fuel part of the year. The gas-diesel offers the most efficient means for converting fuel into power wherever oil and gas are to be used as fuel. It offers the added feature of maximum convenience in changing fuels.

New Gear Cutting Techniques Enhance Automotive Designs

Digest of paper

by E. B. GLEASON

Gleason Works

■ Detroit, Feb. 18

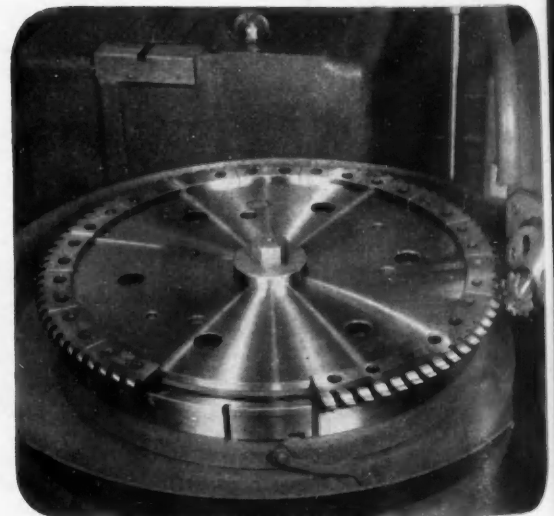
(Paper entitled "Latest Developments in Bevel Gears")

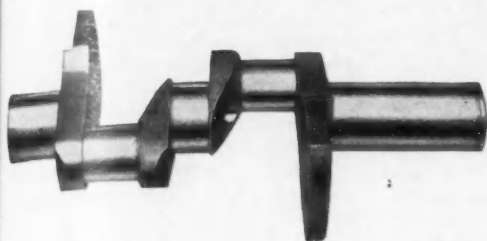
NEW developments in the art of gear cutting will provide the automotive in-

dustry with greater latitude in design and ease of manufacturing. Specifically described by Mr. Gleason were the Revacycle Process for generating straight bevel gear teeth, Curvic coupling design, and a newly developed quenching press.

The Revacycle Process is a method of generating straight bevel gear teeth—in one cut—from the solid metal blank as in the case of passenger car differentials and similar gears. A large diameter, disc-type cutter

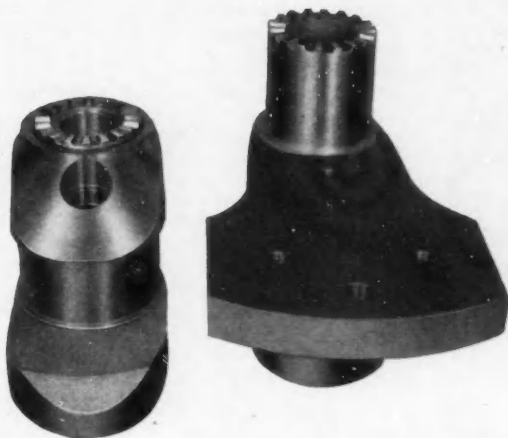
■ Fig. 1—Revacycle disc-type cutter in engagement with an automotive differential pinion. One revolution of the cutter completes each tooth space





■ Fig. 2—Curvic couplings are ideally suited for use in built-up crankshafts

■ Fig. 3 (right) — Components of a built-up crankshaft incorporating the Curvic coupling design



center and drive. The accuracy and uniformity make possible complete interchangeability and the maximum ease of manufacture and assembly.

The teeth of these clutches and couplings are cut and ground from the solid on hypoid gear cutting and gear grinding machines. They possess, as a consequence, the same high degree of accuracy of tooth spacing and fine surface finish obtained in bevel gears.

Ideal for Crankshaft

An ideal application for Curvic couplings is the built-up crankshaft, as shown in Fig. 2. Component parts are illustrated in Fig. 3. This type of coupling simplifies the design and manufacture of crankshafts and allows the use of solid connecting rod bearings instead of the split-type now required. Tooth uniformity obtained in grinding makes possible assembly of the crankshaft from completely interchangeable parts.

Another type of coupling is used with an electric interlock as a safety unit to limit the torque in power drives. It has been successfully used in power-operated control-drivers in aircraft. In this design, the two members of the clutch are held in engagement by a spring. By adjusting the spring tension, the amount of torque which can be transmitted without disengagement of the clutch can be controlled. The load is released by an electric switch at a given amount of disengagement of the clutch.

The same advantages of localized tooth bearing produced in spiral bevel gears can be obtained in the cutting and grinding of Curvic couplings. In most cases convex teeth are used on one member and concave teeth on the other. Concave teeth are produced by the outside surface of the grinding wheel and convex teeth by the inside. Localized tooth bearing is secured by mismatching cutter or grinding wheel diameters. That is, the convex teeth of one member are produced with a cutter or grinding wheel slightly smaller in diameter than that used for the concave teeth of the mating member.

is employed, as shown in Fig. 1, with the blades extending radially from the cutter head. Each blade has two concave cutting edges that produce convex profiles on the gear teeth.

The cutter is mounted to rotate in a horizontal plane and turns continuously at a uniform rate. During the cutting operation, the blank is held stationary while the cutter moves across the face of the gear or pinion and substantially parallel to the root line. This motion makes it possible to produce the straight tooth bottom. The desired tooth shape is produced by the combined effect of the rotating and translating motion of the cutter and the design of the cutter blades. Effective depth is obtained by making each cutter blade progressively longer than the one before it.

The cutter contains three kinds of blades: roughing, semi-finishing, and finishing. Very fast removal of the stock by the roughing blades is made possible by designing these blades to cut on the ends rather than on the sides and to extend the full width of the slot at the depths where they are cutting. These blades act very much like the blades of a broach, taking wide, long chips.

The shape of each finishing blade, too, varies, producing the proper bevel gear tooth form as regards both the tapering width and the changing profile curvature.

Gear blanks must be designed for the Revacyle Process; but in most cases the mountings are interchangeable. Because of the shape of the cutter blades which ease off the ends of the tooth and produce straight bevel gears with localized tooth bearing, Revacyle gears are considerably stronger than the straight tooth differentials, Mr. Gleason reported.

He claimed that the Gleason Revacyle Completing Machine No. 8 provides the fastest means developed for producing Revacyle differentials. For mass production, the machine is equipped with an automatic loader

for placing and removing gears or pinions. An example of the speed with which gears and differential pinions can be produced is a passenger car combination having 16 teeth and 10 teeth in the two members, respectively. Employing a feed of $2 \frac{2}{3}$ sec per tooth and a cutter speed of 128 fpm along with an estimated efficiency of 90%, one machine can produce 67 gears per hr or 100 pinions per hr.

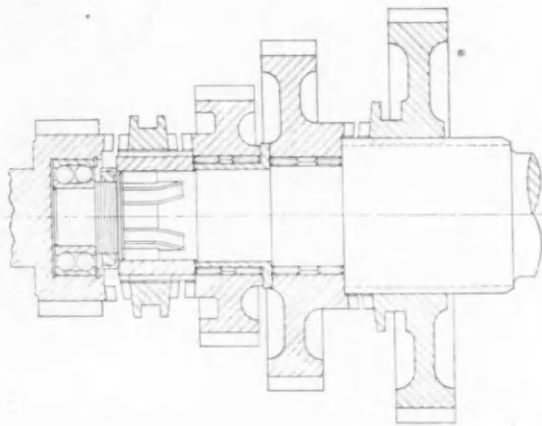
Coupling and Clutch Applications

Curvic clutches and couplings recently developed open up entirely new fields for coupling and clutch applications. Not only do they satisfy industry's quest for a design giving extreme accuracy and maximum load-carrying capacity that can be produced at a fast rate, but they provide, for the first time, a self-contained unit in which the teeth both

Proposed for Transmissions

Among the many possible new applications of Curvic couplings are automotive transmissions. Mr. Gleason's suggestion of an arrangement worthy of serious consideration is shown in Fig. 4.

The third recent development he an-



■ Fig. 4—Proposed Curvic coupling application in automotive transmission design



■ Fig. 5 - New quenching press featuring metallurgically correct oil flow and positive control of the work during the quench

nounced was a new type of quenching press, Fig. 5, for the production of automotive ring gears. It will effect large time savings by ease of handling. The combined features of

metallurgically correct oil flow and positive control of the work during the quench will rapidly make obsolete all earlier equipment in the field, Mr. Gleason predicted.

Engine Deposits Abated With Adequate Ventilation

Digest of paper

by C. E. SMITH
Ethyl Corp.

■ Mid-Continent, Oct. 12

(Paper entitled "Crankcase Ventilation")

ADEQUATE crankcase ventilation is an important factor in reducing engine sludge and minimizing internal engine rusting, Mr. Smith reports after having observed numerous field tests of fleets of ve-

hicles. He indicates the origin of sludge deposits and describes several effective measures for improving engine cleanliness with increased ventilation.

Formation of "cold sludge" is traced to the accumulation of water, carbon particles, and dirt in the oil. The presence of these materials induces emulsification of the oil and carbonaceous materials into a mayonnaise-like mass which deposits on sump screens where—in some instances—it hardens to cause piston ring and oil line plug-

ging. Some engineers believe that certain unsaturated gasoline components passing into the crankcase as blow-by may contribute to the formation of lacquer or varnish on pistons and other engine parts.

One city bus operator had been troubled with excessive cold sludge in the crankcase and valve covers. In several cases, the sludge accumulation caused engine failure by entirely closing the oil pump screen.

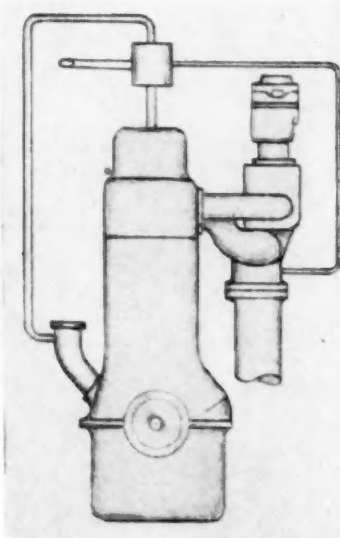
Exhaust "Eductor" crankcase ventilators were installed on 40 of the buses, of two different engine makes, to alleviate this condition. Both were valve-in-head engines of between 425 to 500 cu in. displacement. The engine lubricant was a straight mineral oil and the oil was changed at 4000 mile intervals. The "Eductor" ventilators, as indicated in Fig. 1, were installed with vapor removal lines from both the valve cover and the crankcase. All other openings to the crankcase were closed.

Vapors are removed by a drop in pressure in chamber "A," shown in Fig. 2, caused by the velocity of the exhaust gases passing through tube "B" into tube "C." The drop in pressure can be regulated and the amount of vapor removed from the engine controlled by the distance tube "B" is inserted into tube "C," or by varying the relative sizes of the tubes.

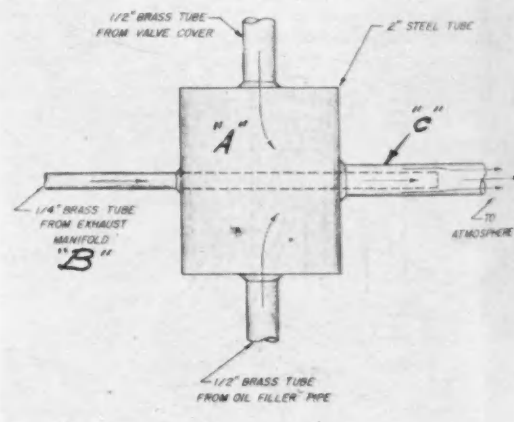
These installations effectively improved engine cleanliness. The major drawback to their use was cleaning them which, because of their welded construction, was a major maintenance operation.

Another series of field tests was conducted with positive crankcase ventilators, the standard ventilator consisting of a tube from the valve cover to the air cleaner. The positive crankcase ventilators were Sirroco blowers driven by 12-v electric motors. Vapors from the valve cover were exhausted to the atmosphere through the fan at a constant volume, regardless of engine speed or load.

A typical blower installation is shown in Fig. 3. Approximately 5 to 7 cu ft of crankcase vapors per minute were discharged by the blower through the 1 1/4 in. tubes. Throughout the 110,000 miles of operation during three winters and two summers, no maintenance was required on



■ Fig. 1 (left) - "Eductor" type crankcase ventilator proved successful in reducing cold sludge deposits in the crankcase and valve covers



■ Fig. 2 - Chamber of "Eductor" ventilator wherein the amount of vapors removed from the engine can be controlled

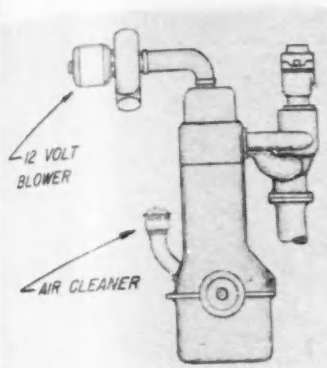


Fig. 3—The positive blower crankcase ventilator substantially reduces sludge, lacquer formation, piston ring wear, and oil consumption

any of the blowers. Examination of the engines at the end of the tests, Mr. Smith related, led to these rather interesting conclusions:

1. Crankcases and valve compartments contained substantially less sludge in blower-ventilated engines;
2. Piston rings wore less;
3. There was less lacquer formation on the inside and outside of the pistons and on the cam faces;
4. Exhaust valves were freer in their guides and easier to remove;
5. Oil consumption was considerably lower, and
6. It appeared to make little difference whether or not fresh air entered the crankcase.

Temperature Affects Cleanliness

Several tests on automotive engines bear out the contention that engine temperatures are equally as important as adequate ventilation in keeping engines clean and thus reducing maintenance and operating costs. Equalization of temperatures throughout

the engine will appreciably reduce total condensation of water vapors and volatile unsaturated hydrocarbons.

Several valve-in-head engines of a mid-western truck fleet were modified experimentally in an effort to approach engine temperature equalization. Sludge deposits and cold corrosion were most severe in the valve cover and on the rocker arm mechanisms. Since the valve cover was sheet steel of high heat conductivity, directly in the cold fan blast, the modification consisted of insulating the valve cover with a commercial ground cork and glue mixture. The insulating coat was applied as a very viscous liquid to a depth of approximately $\frac{1}{8}$ in. No change was made in the ventilation tube from the valve cover to the air cleaner.

Sludge deposits on a typical rocker arm mechanism—after 28,650 miles—with no insulation on the valve cover are compared in Fig. 4 with a comparatively clean rocker arm mechanism at 37,000 miles with the valve cover insulated.

Experimental installations were so obviously successful that the operator has since insulated the valve covers on all his engines with engine cleanliness resulting in both summer and winter. It follows that further improvement should be obtained by insulating the other obvious condenser on an engine, the timing gear case.

Mr. Smith concludes with an outline of the requirements of a satisfactory ventilating system. First, an effective crankcase ventilator should have a minimum capacity to rapidly expel the maximum tolerable amount of blow-by gases from the crankcase and valve compartments. Equally as important is the arrangement of ventilation apertures to eliminate stagnant pockets of vapors. Consideration should also be given to the amount of depression inside the crankcase to prevent excessive amounts of dirt from entering the engine.

Another feature of the successful ventilator is the ability adequately to ventilate the engine regardless of load, engine speed, or vehicle speed. And for practical operation, ventilators should be so designed that they require a minimum of maintenance and will not clog and lose efficiency for reasonable intervals.

Functional Design Demanded for Trucks

Excerpts from paper

by F. B. LAUTZENHISER

International Harvester Co.

■ San Diego, Feb. 7

■ So. Calif., Feb. 8

(Paper entitled "Facts and Predictions About Motor Transport and Its Use")

THE truck of the future must be functionally designed and must be sold to three different people. If it does its intended job economically, the owner will buy it; if it is safe, easy to handle, rides well, and has a convenient driving compartment, the driver will buy it; if the various components are accessible and simple to maintain, the mechanic will buy it.

Unless all three buy the truck, it isn't a good proposition for either manufacturer, seller, or purchaser.

Just what the basically new trucks will look like and what will be incorporated in their designs, no one knows at this time. Let's take a casual glance at some of the features that might be in the mill and deserve at least some reflection by the vehicle designer.

A good example of something that can stand improvement is the cooling system. The cooling fan is a constant expense and continues to be so whether its function is needed or not. Generator output is controlled with more or less expensive voltage and current regulators. Why then don't we control the cooling system in keeping with its actual requirements? Potential saving in power by controlling the fan is far greater than that of the generator.

Devices can be incorporated as a basic part of the original design that will provide means of controlling the fan output, avoiding the waste of horsepower and fuel required to drive the fan when it is not needed. Such devices may take the form of the variable pitch propeller and the magnetic or eddy current fan drive.

One of the lessons the war taught us was the necessity of conserving water, particularly in desert operation, and anti-freeze solutions in sub-zero operation. It is hardly necessary to mention the difficulty involved in getting that last 10 deg of cooling through greater fan output and core capacity to accommodate flash temperatures above the boiling point. The cost of supporting that extra 10 deg during the far greater portion of the operating time when it is not needed is outright waste.

It has been found that a sealed cooling system with but approximately 6 psi pressure will do the trick.

Tire manufacturers tell us we can expect in the "not too distant future" tires that will give 100,000 miles of service. A central tire inflation system, involving special airtight wheel hub mechanisms in the form of rotating pressure joints, was developed for the Army "Duck" vehicle. This system permits the driver to inflate or deflate any or all tires, while the vehicle is stationary or traveling at full speed, and on land or in water.

Aluminum alloys have been used for years in radiator shells, crankcases, pistons, and

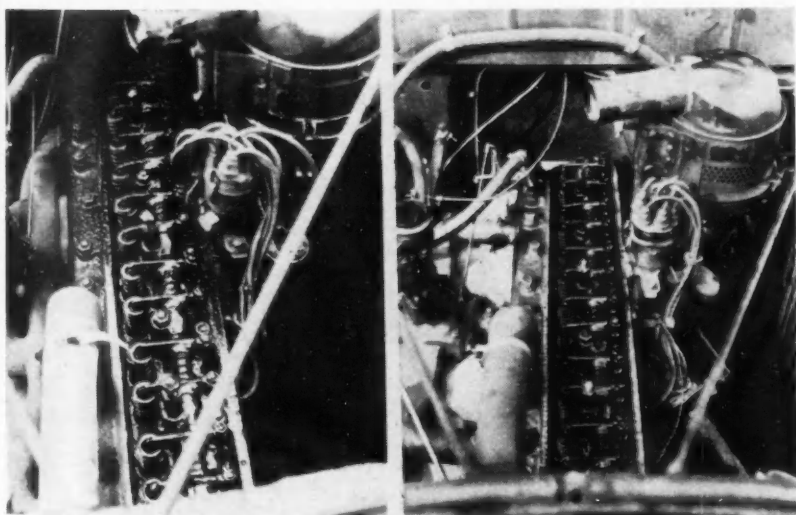


Fig. 4—The rocker arm mechanism on the left, with no insulation on the valve cover for temperature equalization, shows sludge deposits after 28,650 miles. The rocker arm mechanism on the right had an insulated valve cover and is comparatively clean after 37,000 miles of operation

engine oil pans. It is only recently, however, that serious consideration has been given to the use of aluminum alloys in wheels and axle housings. Satisfactory experimental test results point to excellent physical characteristics. An appreciable reduction in vehicle weight will undoubtedly result from the more generous use of aluminum, magnesium, and other light weight metals.

Chassis springs certainly deserve a lot of looking into. Over many years the multi-leaf, semi-elliptical type of chassis spring has remained fundamentally unchanged, although some improvements in design and fabrication have been made. Despite these improvements, the problem of producing a really good ride, especially for heavier vehicles, throughout the full load range, has been more or less a compromise and has not been fully solved.

The two stage or infinitely progressive type of leaf spring may or may not be the answer. Rubber companies are experimenting with air bottles or the air pressure bellows type. Torsion springs, both the steel rod and bonded rubber types, offer interesting possibilities.

Competition demands that long distance truck and trailer operations keep pace with the higher speeds of diesel-powered high speed freight engines and new steam locomotives. Bigger truck engines has been the trend; but for each class of gross vehicle weight, there is an economic ceiling to the extent that weight can be added to obtain the increase in piston displacement.

A 75,000 lb gross weight might economically support the added parasite weight of a 200 to 250 hp engine weighing 3000 lb. But it is doubtful if that loss in payload could be tolerated on a 50,000 lb combination. The answer may be found when the advancement in supercharger design resulting from war developments is applied to gas powered truck engines in the classes below 500 cu in. displacement.

Automatic transmissions, fluid drives, and torque converters will find a wide range of usefulness. Power steering, both air and hy-

draulic, is bound to come for the heavy duty tractor and off-highway vehicle. Two-way radio, polarized headlighting, an SAE standard practice safety fuel supply tank that cannot explode, and adjustable fifth wheels to enable instantaneous shifting of the load between the front and rear tractor axles are but a few of many other new developments expected to come.

Many Lives Saved By Mechanized Arms

Digest of paper

by **BRIG-GEN. G. M. GRANT**
B. C. E.

Canadian Army

■ Canadian, Jan. 16

(Paper entitled, "Machines of a Modern Army")

WAR machines emphasized by our military leaders spared the lives of countless men, General Grant declared. But the real tribute should be given to the engineers whose ingenious designs and technical advice to the armed forces made the equipment so effective.

Many a battle was won by the Canadian and Allied armies by advantageous employment of newly developed devices to surprise the enemy.

One of the items that contributed to the effective mobility of the ground forces was a waterproofing method. On the Jeep, all electrical equipment including spark plugs was covered with a compound that looked like putty. Wiring was covered with a waterproof varnish. Attached to the car-

buretor air intake vent was a flexible tube that extended above the vehicle.

The crankcase breather was sealed. As the gasoline tank had to have an air inlet, a small copper tube was soldered to the filler cap and it also extended well above the vehicle. And lastly, a soldier's rubber ground sheet was suspended in front of the radiator to reduce, as much as possible, the flow of water back over the engine.

It was quite a sight to see Jeeps running through 4½ ft of water with nothing but the driver's head and several pipes showing above the surface.

Another effective utilization was made of the waterproofing technique in the special tank known as the "D.D.," meaning "duplex drive." In water, a propeller pushed the tank along, and on land, it moved on its own tracks. It was a standard fighting tank so completely sealed that no water could enter.

The propeller was fastened to a shaft extending from the normal power train that furnished the drive to the tank tracks. Covering the complete upper structure and securely fastened to it was a waterproof, airtight, air-filled canvas cover. This balloon-like envelope not only gave buoyancy to the tank, but also camouflaged its identity.

So that these "Loch Ness" monsters could go into immediate action after swimming to the beach, light charges of explosives were fastened to the fixtures that held the canvas envelope in place. On reaching shallow water, the tank commander had only to press a button which exploded the charges, blowing away the cover and exposing his guns for action.

From "D" Day until the famous "Mulberry" Dock was operating, many thousands of all types of equipment came through the water from the landing crafts to the beaches with a minimum of loss due to their waterproofing.

Proximity Fuse Revealed

An amazing invention that made the anti-aircraft gun so effective a weapon was the "V. T.," or variable time fuse—known in the Army as the proximity fuse. It consists of a self-powered radio transmitter and receiver, small enough to fit into the nose of an anti-aircraft shell and tough enough to withstand firing shock. As the gun is fired, the shock smashes a glass container of electrolyte which is forced into the plates of a battery by the spin of the shell.

Current starts flowing; the radio tubes light up; and the transmitter starts to broadcast a continuous wave. When part of this wave is reflected back to the shell from the target—an airplane or flying bomb 70 ft away—an electronic switch is tripped. Current is then shot through the detonator, exploding the shell at the ideal distance for maximum effect.

With this type of fuse in their shells, a ring of anti-aircraft guns around Antwerp was able to shoot down 75% of the "flying bombs" heading for the city and the port.

These are but a few of the many mechanical monsters successfully employed against the enemy forces. Included in the long list of mechanized weapons are: huge flame-throwing tanks called "Crocodiles," and their smaller counter-part, the "Wasps;" "Buffaloes," amphibious tank-like vehicles; "Weasels," small tracked vehicles which could run in swamps or through shallow

turn to p. 48

SAE Coming Events

Meeting	Date	City	Hotel
● West Coast Transportation & Maintenance	Aug. 22-24	Seattle	New Washington
● Tractor	Sept. 11-12	Milwaukee	Hotel Schroeder
● Aeronautic Meeting and Aircraft Engineering Display	Oct. 3-5	Los Angeles	The Biltmore
● Transportation & Maintenance	Oct. 16-17	Chicago	Knickerbocker
● Fuels & Lubricants	Nov. 7-8	Tulsa	Mayo
● Air Transport Engineering	Dec. 2-4	Chicago	Edgewater Beach



News..

..OF THE SOCIETY

Aircraft Electrical Group Expands To Cope With Postwar Flying Needs

ACTIVELY expanding its program to include aircraft electrical equipment items previously not considered due to the pressure of work on electrical problems pertinent to aircraft generators and motors, SAE Committee A-2, Aircraft Electrical Equipment, has mapped an ambitious program covering postwar needs of private flying, commercial aviation, and the military services.

Committee A-2, which formerly functioned as a working committee dealing primarily with motor and generator projects, will now operate largely as a steering committee with temporary project subcommittees assigned responsibility for detailed work. Additional appointments to the membership reflecting the expanded nature of the Committee have been made by Chairman E. Thelen, Eclipse-Pioneer Div., Bendix Aviation Corp.

Among the new projects undertaken by the Committee as a result of the change in operational policy are:

1. Standardization of batteries for both personal and transport aircraft;
2. Development of standardized maintenance test equipment;
3. Standardization of lights, and
4. Standardization of cable terminal lug sizes.

Development of personal aircraft battery standards was initiated by Committee A-2 at the recommendation of the National Aircraft Standards Committee. The project was assigned to H. C. Riggs, Electric Storage Battery Co., who has formed a subcommittee to assist him. Although Mr. Riggs has already received some data from aircraft manufacturers pertinent to sizes and general requirements to be considered in the program, he reported that additional information remains to be gathered from aircraft manufacturers and perhaps engine manufacturers on items such as engine torque requirements, spill proofing, and service life. Present indications are that personal aircraft manufacturers desire three 12-v batteries, and it is planned that standards will be developed accordingly.

A preliminary survey by Mr. Riggs' subcommittee circulated among aircraft manufacturers and airline operators indicates that transport aircraft manufacturers desire standardization of a 24-v type battery with an output of 40 to 45 amp. The prime requisite of a battery for transport utilization, the Committee agreed, is that it be of sufficient size to facilitate starting of one engine or an auxiliary engine.

Secondary consideration is the standardi-

zation of dimensional requirements, plug sizes, and weight. Present plan of action to be followed by the subcommittee is to coordinate recommendations received from airline operators and aircraft manufacturers to serve as a basis for developing envelope dimensions and performance requirements.

Improved Maintenance Testing

With airline operators extending their maintenance shops and servicing facilities throughout the world, an urgent need arises for improved test methods and equipment to test electrical units. Development of new test equipment is to be studied by the Committee and should be of great value to the air transport industry.

Presented to the Committee by K. Lo-

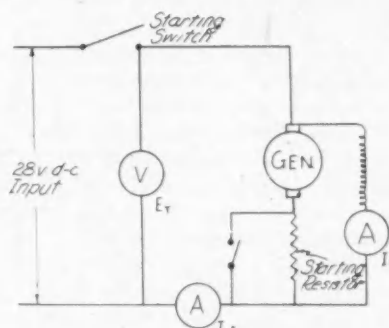


Fig. 1—Setup for testing d-c aircraft generators by the motorizing method in which are checked E_f , the input voltage, I_A , the armature current, and I_f , the field current

gosch, Eclipse-Pioneer Division, Bendix Aviation Corp., was a report covering recommended test procedures for accessories such as generators, inverters, regulators, motors, and batteries. In testing d-c generators, for example, Mr. Logosch proposed that they be tested by the motorizing method. Required for the electrical check are a starting resistor, dynamometer, Strobotac, and a motor-generator set.

Initial operation using the setup as shown in Fig. 1, consists of checking input voltage, input and armature current, the field current, and the starting resistor for easy starting. Also included in the electrical phase of the test are a check on the generator field

resistance by the drop method and current-torque limits against manufacturer's specifications.

The mechanical check is performed by placing the unit in a shock-mounted "V" block and motorizing and checking the vibration amplitude. If the armature is out of balance, the vibrometer reading will not fall within specified limits. After having passed all the foregoing tests and showing no signs of casting cracks or fatigue failures, the generator can be considered fit for aircraft use.

It is planned to submit this report and a questionnaire to equipment manufacturers and, if sufficient interest is shown, a subcommittee will be formed to further study the problem and present recommendations to airline operators. Ultimate goal of this project is the standardization of portable testing equipment for service and maintenance operations. The military services have shown an interest in this project.

Light Standardization

The next problem, obtaining adequate aircraft lighting—especially for personal aircraft—has been a source of concern for a considerable length of time due to lack of standards. Chairman Thelen will refer this matter to the personal aircraft steering committee for determination of the items requiring consideration. Committee A-2 will then proceed on the recommendations received.

The last problem, development of terminal lug standards for aluminum cable, was assigned to a subcommittee under the chairmanship of J. H. Thompson, Aircraft-Marine Products, Inc. Found feasible at a recent meeting of the subcommittee was the preparation of tentative standards for terminal lugs for aluminum cable size 8, which is .155 in. in diameter, to .0000, .560 in. in diameter.

Proposed standards will be prepared by subcommittee members and circulated for comment to wire, equipment, and aircraft manufacturers, aluminum companies, and the Aeronautical Board Working Committee. No attempt will be made in these standards to standardize crimping methods.

In addition to the present committee members consisting of Chairman Thelen; E. G. Haven, General Electric Co.; K. R. Smythe, Glenn L. Martin Co.; E. E. Minor, All-American Aviation, Inc.; and J. R. North, Commonwealth & Southern Corp., the following new members have been added: E. P. Buckthal, United Air Lines, Inc.; J. E. Mulheim, Westinghouse Electric Corp.; O. Olsen, Grumman Aircraft Engineering Corp.; C. A. Packard, Struthers-Dunn, Inc.; H. C. Riggs, Electric Storage Battery Co.; D. N. Timbie, Pennsylvania-Central Airlines; L. B. Moore, Grimes Mfg. Co.; H. C. Schroeder, Jack & Heintz Precision Industries; F. D. Shanely, Lear, Inc.; and J. Ottmar, Spencer Thermostat Co.

Membership Outlook

REPORTING a 16% increase in applications over last year's figure for the month of June, Chairman E. M. Schultheis of the General Membership Committee forecasts a good Section membership year ahead. Nine Sections and Groups exceeded their quota for June, 1946—Metropolitan, Southern California, Northern California, Baltimore, Oregon and Philadelphia Sections; and British Columbia, Mohawk-Hudson and Williamsport Groups.

CHANGES

Proposed by Iron & Steel Group

The Executive Committee of the Iron and Steel Technical Committee has proposed a tentative reorganization program intended to broaden the scope, enlarge the activities, and step up the tempo of the Iron and Steel Technical Committee, according to Chairman W. P. Eddy, Jr.

"In reconstituting the Iron and Steel Division of the former General Standards Committee of the Society, the Executive Committee has modified the policy creating Panel Structure by reducing the number of Panels from ten to five."

Said Chairman Eddy: "Combination of less effective panels with those that have been more active will contribute to the compactness and smooth functioning of the technical committee."

Each panel, under the proposal, will have its own small steering committee selected at annual elections. The Executive Committee of not more than 15 members will be elected annually by the entire membership of the Iron and Steel Technical Committee.

All elections are to be by secret ballot.

The five new Panels proposed in the reorganization plan cover these fields:

- Steel Producers,
- Foundries,
- Automotive,
- Tractor and Earth Moving, and
- Miscellaneous Users.

"The general policy as proposed under the broader scope of the Committee includes publication of SAE iron and steel specifications for general users as in the past," continued Chairman Eddy. "However, in the future an effort to write advanced specifications attractive to large steel users including composition and other definite requirements will be made."

"Investigational work will be continued in connection with standardization by subdivisions responsible for standardization projects, while provision will be made for undertaking other investigational work not directly connected with standardization."

"When the reorganization plan is completely finished and the details worked out and approved by the Executive Committee, the proposal will be submitted to the entire personnel of the Iron and Steel Technical Committee for final approval. Reorganization of the Committee is expected to be finished by the first of next year."

Present Projects Forge Ahead

PANEL and Subdivision chairmen report progress in the many fields of the Iron & Steel Committee activity.

Brazing Alloys & Electrodes

Approaching standardization of copper and silver base brazing alloys and iron and steel arc welding electrodes, a joint activity with the Nonferrous Metals Committee, is indicated by letter ballot returns. Partial returns also strongly favor an additional group of hardenability bands worked out jointly by Subdivision III and the Alloy

Steel Committee of the AISI from a large volume of test data submitted by many industry metallurgists.

AMS Revised

Reporting on the action taken by the SAE Aeronautical Material Specifications Subdivision in Los Angeles, J. B. Johnson, AAF Air Materiel Command, Wright Field, Dayton, and chairman of Panel C (Aircraft), said that approval was given to a revision of AMS 5066 corrosion resistant, high pressure, hydraulic steel tubing. Two point

Revamped Iron Gears Aims to

Jominy hardenability values recommended by steel producers for low alloy steels were also approved.

Deletion of the silicon content from the three specifications for free cutting manganese steels, AMS 5022B, 5024A and 5025 was approved, while the addition of applicable hardness ranges for thin gage material was recommended to the specification for sheet steel and strip, AMS 5040C, 5042C and 5044A.

F. P. Zimmerli, Barnes-Gibson-Raymond Division, Associated Spring Corp., and chairman of Panel H (Springs), said that the members of Panel H urge approval of the addition of C1074 and 9262 steels to the SAE Handbook. Continuation of 1085, 1090, 1095 and X1065 or 1066 steels will completely satisfy the need for carbon steels for springs, he said. The addition of chrome silicon steel to the list of alloy steels was also urged.

Publication of a series of articles in the *SAE Journal* explaining hardenability and its usefulness in terms appealing to engineers was urged by R. W. Roush, Timken-Detroit Axle Co., chief metallurgist. A wealth of data is available including the paper given some time ago at a Metropolitan Section Meeting by A. L. Boegehold, chief metallurgist of General Motors Corp.

Interest in Hardenability

The growing interest on the part of steel users in the specification and purchase of alloy steels by the "H" or hardenability band basis was stressed by Mr. Roush. He pointed out that the latest reports of Subdivision III are very encouraging because of the manner in which heats have fallen within the bands. However, the need for adopting narrower bands was urged by several users if the hardenability band basis of specifying is to come into general use.

Approval was given by the Iron and Steel Executive Committee for the publication of a joint SAE-AISI hardenability manual, similar to the first tentative hardenability handbook, including the bands published in the first handbook and also containing the SAE recommended practice for Hardenability Testing.

A research program having to do with

Iron & Steel Group Broadened Scope



W. P. Eddy, Jr.

chairman,

**SAE Iron & Steel Technical
Committee**

Mr. Eddy came to the chairmanship of the important Iron & Steel Technical Committee five months ago with 10 years' background of active work on SAE technical committee projects.

He was the first chairman of the wartime Iron & Steel Committee of the SAE War Engineering Board whose contributions helped win for SAE the first Distinguished Service Award given by the Ordnance Department of the U. S. Army.

Mr. Eddy was a member of the SAE-AISI Hardenability Data Committee, metallurgical project of widespread importance and was vice-chairman of the Iron & Steel Technical Committee before succeeding F. P. Gilligan as chairman. (SAE Journal, March, 1946, p. 18.)

Mr. Eddy is chief of engineering operations at Pratt & Whitney Aircraft, Division of United Aircraft, having assumed that position early in 1946 in addition to his duties as materials engineer. Previously he had served for many years as metallurgical and service engineer for GMC Truck & Coach Division of General Motors Corp.

others favored a slight increase in nickel, chromium and molybdenum, with only a minor interest in favor of increasing chromium and molybdenum alone. Further discussion before the AISI Alloy Technical Committee has resulted in some work being done on a particular analysis to determine its hardenability characteristics in comparison with 8600 and 9800 series. The

concluded on p. 43

the method of determining hardenability in which various laboratories have participated has showed a wide spread of results, according to A. L. Boegehold, chairman of Subdivision V. Further discussions will extend to possible adoption of a method of hardenability testing for steels having low hardenability such as plain carbon steels and low carbon carburizing steels.

The program already carried out involved hardness testing of samples, renormalizing in a controlled atmosphere to prevent decarburization, and end quenching in accordance with the SAE Recommended Procedure for Determining Hardenability.

Cold Drawn Steels

Investigation and survey of the field of cold drawn steels and the possibility of specifying hardness and other ordinary cold drawn tensile properties instituted by the Army Ordnance Department during the war and carried on by the SAE War Engineering Board's Iron and Steel Committee under the direction of H. B. Knowlton, International Harvester Co., was approved and accepted by the Iron and Steel Executive Committee. A joint SAE-AISI committee headed by Mr. Knowlton has been designated as a new Subdivision XVII. Other members of the Subdivision will be J. D. Armour, Union Drawn Steel Co., A. L. Boegehold, General Motors Corp., M. N. Landis, LaSalle Steel Co., H. M. Smith, Wyckoff Steel Co., and F. A. Young, Ford Motor Co.

An effort will be made to effect the creation of minimum physical property specifications for certain grades of cold drawn steels other than "screw stock" or low carbon free machining steel. A research project is being considered to determine the relative merits of cold drawn and heat treated steels having similar yield points; also a determination of the notch fatigue strength of the two types of steels having similar static properties.

Automotive Castings

A joint meeting in May of Subdivision IX of the Iron and Steel Committee and Subcommittee IV of A-7, ASTM, dealing with automotive iron castings revealed the

opinion, according to V. A. Crosby, chairman of Subdivision IX, that the time is about right for some action to be taken to provide a product suitable for more precise response to heat treatment after partial malleabilizing. The viewpoint of the SAE members was that a definite end product is desired and that there is no reason why material cannot be specified which will give the uniform response to heat treatment—induction or flame—desired.

It was apparent that a microstructure for quick, efficient hardening would work a hardship upon some producers and likewise it was felt that a specification including both chemical composition and tensile properties would be unduly restraining. It was the thought of some members of the joint committee that a specification including three or four grades of pearlitic malleable based on hardness ranges for each could be worked out if hardness is a sufficient guide.

The first move toward a hardenability specification for steel castings was tentatively approved for one year by ballot of the Executive Committee, according to Gosta Venerholm, Ford Motor Co., and chairman of Subdivision X (Automotive Steel Castings). The Subdivision was charged with the responsibility of watching production and use carefully under the new specification and reporting again at the end of a year.

Alloy Steels

A variety of subjects is in process of settlement by Subdivision XIV (Alloy Steels) according to E. R. Johnson, Republic Steel Corp., and chairman of the Subdivision.

In considering NAX-9100 and NAX-X-9100 steels, members of the Subdivision held that NAX steels are essentially proprietary analyses and, therefore, should not be included in the SAE group of steels.

Much Subdivision interest centered around the 8600 and 8700 series steels. It was pointed out that the AISI Alloy Technical Committee have retained the 8600 series in its entirety and have included 8655 and 8660. The number of 8700 steels was reduced with the result that Subdivision discussion indicated some members favorable to increasing the molybdenum content of the 8700 series from 0.30 to 0.40, while

Board Propels Study Of Varied Projects

THE Technical Board meeting at the Summer Meeting at French Lick, June 5, was packed with action.

Personnel changes and appointments to technical committees were disposed of. Terse reports on a score of active projects were heard. New projects were discussed and assigned to their proper committees. A meeting with top Army Ordnance officers to plan for SAE study of peacetime automotive military problems was planned. Similar need for close study of aircraft problems with top-side AAF officers was seen. A survey of the technical needs of the heavy earthmoving, bulldozer equipment industry was launched.

Among the technical committee organization changes approved was the long standing Brake Committee under the sponsorship of B. B. Bachman, Autocar Co. T. P. Chase of General Motors Corp. will chairmen the new committee which will launch its activities with an agenda of some five or six active problems.

Personnel changes and additions were approved for the Electrical Equipment Committee, Lighting Committee, Tire Cooperating Committee, Iron and Steel Committee, Non-Ferrous Metals Committee, Screw Threads Committee, and Truck Nomenclature Committee.

The scope of the former Lubricants Committee was broadened to include fuels, and the name changed to the Fuels and Lubricants Committee. Under its banner will come SAE standardization of both fuels and lubricants. Fuels and Lubricants Committee will be responsible for reviewing and determining the extent to which SAE will publicize all CRC reports. Under the new committee, closer cooperation will be promoted with CRC, ASTM and API.

Active projects reported on include a recent one covering the standardization of license plate mountings. Both the Engineering Liaison Committee of the AMA and the Engineering Committee of the AAMA asked SAE assistance running parallel with efforts of the AAMVA to work out uniform dimensions for license plates.

R. H. McCarroll, Ford Motor Company executive engineer, and sponsor of the SAE Plastics Glazing project reported that recommendations covering revisions in ASA Code Z26.1 to provide for use of transparent plastics for certain types of motor vehicle glazing are expected from the committee within the next 60 to 90 days. This report will be submitted to the ASA Sectional Committee on this subject.

Agreement has been reached in the committee on all parts of the code except the test for warpage of plastics and the chemical resistance tests showing the effect of commercial cleaners, tar removers, etc., on plastics. Tests on both subjects are now being run by plastics' representatives on the committee.

The job of developing a specification for flame arresters for vehicles used in inflammable environments was turned over to the Tractor Technical Committee with C. G. A. Rosen, Caterpillar Tractor Co., as sponsor.

At the request of the SAE Spring Committee the Technical Board approved the translation of a highly prized German treatise on springs recently brought from Ger-

E. F. Lowe to Retire As Coast Manager

EDWARD F. LOWE will retire on October 1 as Assistant General Manager and West Coast Manager following more than 12 years as a member of SAE Headquarters staff.



Edward F. Lowe

Mr. Lowe's retirement is in line with an age-based retirement plan recently adopted for Headquarters staff personnel, according to a statement by John A. C. Warner, SAE Secretary and General Manager.

Mr. Lowe was a prominent figure in Society affairs before joining the headquarters staff in 1934, having been chairman of the SAE Metropolitan Section, chairman of the SAE Membership Committee and a member of the Transportation and Maintenance Activity Committee, as well as being active in standardization work. Born in Chattanooga, Tenn., Mr. Lowe first came into touch with the automotive industry by way of the paint and varnish business. Later he was one of the organizers of the Monarch Governor Co. and pioneered development of the automatic type of governor in the motor truck field. Later he became general manager of K. P. Products Co. and, after merger of K. P. with Handy Governor Corp., vice-president in charge of sales of the latter organization.

Throughout Mr. Lowe's association with SAE headquarters staff, he has been concerned importantly with membership and Sections work and has played a major role in the rapid growth and development of these operations in recent years. A full member of SAE since 1924, Mr. Lowe has a veritable host of friends and admirers throughout every branch of the Society and the industry to which he has made such substantial contributions.

many as a background for comment and recommendations in a forthcoming report of the Spring Committee.

Iron and Steel Committee Reorganization

The Technical Board gave its approval to the reorganization plans of the Iron and Steel Technical Committee by its Executive Committee as given in a report from Committee Chairman W. P. Eddy, Jr., Pratt & Whitney Aircraft, and presented by Committee Sponsor R. H. McCarroll, Ford Motor Co., provided the proposed realignment is approved by the entire committee through a letter ballot.

It is tentatively planned that publication of SAE iron and steel specifications for general use will be continued. Attempts will be made, according to the reorganization proposal, to write advanced specifications attractive to large users, such specifications to include compositions and other definite requirements.

Research and investigational work required in connection with standardization will, as in the past, be carried out or sponsored by the subdivision responsible for the standardization project. Provision will be made for the undertaking of other investigational work not directly connected with standardization projects.

To carry out these policies, plans call for streamlining of the committee and reduction of the number of panels from ten to five. Each panel will have its own small steering committee elected annually by the members of the panel. It is also proposed that each panel have direct representatives on the Iron and Steel Executive Committee. For further details on the proposed reorganization, see story on p. 26.

C. G. A. Rosen, sponsor of the Torsional Vibration project, told of an invitation from the Navy Bureau of Ships to the committee to assist the Naval Trial Board in a series of seagoing tests of German submarines.

Fuels Work Added By Lubricants Group

INCREASED scope of the SAE Lubricants Committee has been authorized by the SAE Technical Board to include fuels as lubricants. The Committee has been renamed the SAE Fuels and Lubricants Technical Committee in keeping with the widened area of operation delegated to it.

Expansion of the Committee stems from action taken by the Technical Board last January to reorient SAE standardization divisions into the new technical committee structure. Purpose of the realignment program is to expand the permissible scope of these groups to encompass all phases of their respective technical activities.

Chairman E. W. Upham, Chrysler Corp., has advised the Committee that under the new arrangement, the Technical Board sponsor will be the Board chairman, J. M. Crawford, General Motors Corp. Functions of the Committee in its expanded scope of operation were outlined by Mr. Crawford as follows:

1. To handle all standards matters in connection with fuels and lubricants;
2. To advise the Technical Board on recommendations as to initiation of new projects in CRC;

3. To initiate new projects in the SAE Committee which, in its opinion, do not conflict with the objectives and purposes of CRC, and

4. To advise the Technical Board as to the desirability from the SAE point of view of publication of CRC reports that may be referred to the SAE Committee.

A review of Committee membership covering changes and additions to cope with newly assigned fuels work—particularly tractor fuels—is now under way. Additional members to be approved by the Board will include technicians from both the petroleum and automotive industries. Another proposal being considered by the Committee is the development of written rules covering the Fuels and Lubricants Committee procedure.

Revamp Aero Packaging For Peacetime Needs

ASSURED at the initial meeting of the SAE Aeronautic Committee S-6, Preservation and Packaging of Aeronautical Parts, and Committee S-6A, Packaging of Aeronautical Parts and Equipment, was early modification of wartime standards, specifications, and recommended practices for commercial application.

Ultimate aim of Committee S-6 is the preparation of complete specifications covering preservation and packaging of aeronautical parts and equipment for the commercial field. Present specifications and standards will be revised if needed, and new ones prepared as required. To achieve its goal, the Committee has established the following temporary subcommittees to review those specifications for which industry has immediate need:

- S-6A—Packaging of Aeronautical Parts and Equipment
- S-6B—Preservatives and Humidity Cabinet Testing
- S-6C—Moisture Barriers
- S-6D—Depreservation of Engines

Concerned with preservation and packaging of engine parts, Committee S-6A, under the chairmanship of P. J. Kondla, Pratt & Whitney Aircraft, has set about the task of centrally locating in one volume the preservation and packaging data prepared by the several SAE committees during the war. Members of the Committee concluded at the first meeting that wartime requirements are in excess of needs for domestic shipment. It was proposed, therefore, that a new manual be set up with two sections, one covering requirements for domestic shipments and the other export shipments. It was assumed that the Army and Navy will consider acceptance of commercial packaging practices developed by the Committee for domestic use provided they are on a sound basis.

Prime function of Committee S-6B will be the preparation of a specification covering soft film preservative compounds for domestic shipment through coordination with suppliers of preservative compound. Because of the troubles encountered in depreservation of engines, it was agreed that the compound developed should have good preservative qualities and also be easily removable by wiping. The proposed specification will be circulated to all interested parties prior to final approval.

E. W. Rentz Succeeds Lowe on West Coast

EDWARD W. RENTZ, Jr., staff engineer in the aeronautical department of SAE headquarters staff, will succeed E. F. Lowe as West Coast Manager on October



Edward W. Rentz, Jr.

1, SAE Secretary and General Manager John A. C. Warner has announced. Playing a vital role in the vast aeronautical standardization job accomplished by SAE during the war period, Mr. Rentz goes to his new duties with a wide acquaintanceship among SAE men throughout the country and a thorough knowledge of SAE operations and policies.

A native of Detroit, Mr. Rentz was graduated a Bachelor of Aeronautical Engineering from the University of Detroit in 1926, after serving in the U. S. Army during World War I. Between high school and college he worked for Cadillac Motor Division of General Motors Corp.

Before joining the SAE staff on Feb. 24, 1942, Mr. Rentz had broad experience in liaison work between laboratory and engineering departments and outside agencies as a member of Briggs Mfg. Co.'s engineering department. His work at Briggs was preceded by sales engineering activities in the plant equipment field and by five years of national contact with aircraft and aircraft engine manufacturers for the Heywood Starter Co.

Beginning early to participate actively in athletics, Mr. Rentz was captain of his high school baseball team and later achieved the top goal of all bowlers—a 300 game. He is married and has one child.

The West Coast Office, under Mr. Rentz as under Mr. Lowe, will continue to serve the Salt Lake and Spokane Groups as well as the West Coast Sections.

The other project assigned to this group is the investigation of the AN humidity cabinet for reproducibility of test results. If found satisfactory, the AN cabinets will be recommended to industry by the Committee. Should the investigation prove the AN cabinet unacceptable, a report will be prepared and submitted to the Government for appropriate action. Selected as chairman of Subcommittee S-6B was M. H. Young, Wright Aeronautical Corp.

To be reviewed by Subcommittee S-6C are AMS 3535 and 3610A on moisture barriers. It is felt that AMS 3535 should be revised to embrace the new aluminum-foil plastic-film laminates that are now available for enclosing engines. The latter specification is to be reviewed with particular attention given to the economics of commercial packaging where the storage period is not as long as that required for the AMS 3535 type moisture barrier. Chosen as chairman of this subcommittee was B. L. Sharon, Lycoming Division, Aviation Corp.

Formation of Subcommittee S-6D is being held in abeyance pending receipt of information from the airlines as to the extent of their depreservation problems.

Members of Committee S-6 are: A. Ayers, Pratt & Whitney Aircraft, chairman; R. P. Lambeck, Hamilton Standard Propellers; B. L. Sharon, Lycoming Division Aviation Corp., and C. F. Bunker, Bendix Aviation Corp.

Spark-Plug Sticking Factors Are Exposed

REVELATION of the causes and possible remedies for spark-plug sticking—a vexing problem to aircraft operators—will soon be made in a report by the SAE Ignition Research Committee.

Conclusions reached by the Committee concerning spark-plug sticking in reciprocating aircraft engines were based upon results of a survey conducted among spark-plug and engine manufacturers, airline operators, the AAF, and the National Advisory Committee for Aeronautics. The report will deal with phases of the problem such as the relationship of plug and cylinder bushing threads to sticking, the value of stainless steel bushings in the elimination of sticking, and the relative merits of lubricants and plating.

Among the other spark-plug problems discussed by the Committee at its last meeting was plug durability. Although the plug is satisfactory in freedom from ceramic breakage, the problem perplexing engineers seems to be in maintaining the integrity of the well. Chairman A. L. Beall, Wright Aeronautical Corp., felt that this can be accomplished by filling both the well and the elbow with a sealing compound, or by providing an adequate seal at the spark-plug cable connection. Both of these approaches would entail an increase in the barrel size. A method which might permit retention of present barrel sizes and produce the same effect is the change to a 5 mm cable.

Other phases of spark-plug design are being explored by the Committee, as consensus among ignition experts has it that, although spark plugs are adequate for present engines, anticipated higher output engines will necessitate better plugs.

1946-1947

SAE Section

Baltimore

Chairman: **Lloyd J. Hammond**, Hammond & Seidel.

Vice-chairman: **Herman Hollerith, Jr.**, materials engineer, Glenn L. Martin Co.; vice-chairman, Aeronautics: **G. B. Fenwick**, president, Pan-Maryland Airways, Inc.; treasurer: **Harold Neighbors**, partner, Air Brakes & Controls; secretary: **Richard D. Taber**, research engineer, American Hammered Piston Ring Division, Koppers Co.

Buffalo

Chairman: **Paul E. Hovgard**, associate director, Cornell Aeronautical Laboratory.

Vice-chairman: **L. J. Clapsadle**, chemist, Linde Air Products Co.; secretary-treasurer: **B. E. O'Connor**, assistant chief engineer, Houde Engineering Division, Houdaille-Hershey Corp.

Canadian

Chairman: **C. E. McTavish**, vice-president, general manager, Perfect Circle Co., Ltd.

Vice-chairman: **Edwin F. Armstrong**, assistant chief engineer, General Motors of Canada, Ltd.; vice-chairman, Hamilton District: **Fred J. Beattie**, sales manager, Wallace Barnes Co., Ltd.; vice-chairman, Kitchener District: **John A. Lucas**, sales manager, Tire Division, Dominion Rubber Co., Ltd.; vice-chairman, Montreal District: **R. G. Perry**, general traffic manager, Provincial Transport Co.; vice-chairman, Niagara Peninsula: **C. K. Edward**, general purchasing agent, Atlas Steels, Ltd.; vice-chairman, Oshawa District: **Kenneth Braithwaite**, works manager, Duplate Canada, Ltd.; vice-chairman, Quebec District: **Col. F. W. Miller**, vice-president, general manager, Collins & Aikman of Canada, Ltd.; vice-chairman, Sarnia District: **Bernard Goulston**, chief chemist, Imperial Oil, Ltd.; vice-chairman, Windsor District: **A. Stan Ellis**, sales manager, Mercury & Lincoln Division, Ford Motor Co. of Canada, Ltd.; treasurer: **W. W. Taylor**, vice-president, general manager, Prest-O-Lite Battery Co., Ltd.; secretary: **Warren B. Hastings**, editor, manager, Canadian Motorist, and manager of tests, contests, Canadian Automobile Association.

Chicago

Chairman: **W. H. Oldacre**, president, general manager, D. A. Stuart Co.

Vice-chairman: **W. W. Davies**, superintendent of aircraft planning, United Air Lines, Inc.; vice-chairman, Aeronautics: **Daniel V. O'Leary**, aeronautical engineer, United Air Lines, Inc.; vice-chairman, Fuels & Lubricants: **M. D. Gjerde**, manager, sales

technical service department, Standard Oil Co. of Indiana; vice-chairman, Parts & Accessories: **Bryan E. House**, chief engineer, Bendix Products Division, Bendix Aviation Corp.; vice-chairman, Passenger Cars: **H. E. Churchill**, chief research engineer, Studebaker Corp.; vice-chairman, Tractor & Diesel Engines: **Raymond Bowers**, research engineer, International Harvester Co.; vice-chairman, Transportation & Maintenance: **Orville A. Brouer**, head, general automotive department, Swift & Co.; vice-chairman, Transportation & Maintenance, Truck & Bus: **Russell H. Johnson**, engineer, General American Aerocoach Co.; treasurer: **Paul H. Oberreutter**, president, Mid-West Dynamometer & Engineering Co.; secretary: **H. S. Manwaring**, engineer, International Harvester Co.

Cincinnati

Chairman: **Wilburn E. Meyer**, superintendent of equipment, highway maintenance, D.P.W., City of Cincinnati.

Vice-chairman: **Edward W. Stock**, assistant to president, Trailmobile Co.; treasurer: **A. George W. Brown**, transportation engineer, assistant treasurer, Schenley Distilleries Motor Division, Inc.; secretary: **William A. Kimsey**, engineer, R. K. LeBlond Machine Tool Co.

Cleveland

Chairman: **John R. Cox**, managing partner, Balas Collet Mfg. Co.

Vice-chairman: **Robert Cass**, assistant to president, White Motor Co.; vice-chairman, Akron-Canton District: **Donald G. Smellie**, chief engineer, Hoover Co.; vice-chairman, Aeronautics: **A. E. Wilson**, assistant sales manager, Automotive Division, Pesco Products Co.; vice-chairman, Transportation & Maintenance: **W. G. Piwonka**, superintendent of equipment, Cleveland Transit System; vice-chairman, Truck & Bus: **John P. Weber**, representative, Bendix-Westinghouse Automotive Air Brake Co.; treasurer: **Norman Hoertz**, chief engineer, service division, Thompson Products, Inc.; secretary: **R. F. Steeneck**, district manager, Cleveland Fafnir Bearing Co.

Dayton

Chairman: **W. H. Geddes**, assistant chief engineer, United Aircraft Products, Inc.

Vice-chairman: **F. E. Lehman**, manager, sales and service, Aeroproducts Division, GMC; vice-chairman, Columbus District: **Verne H. Schnee**, assistant to director, Battelle Memorial Institute; vice-chairman, Springfield District: **Harvey W. Hanners**, assistant research engineer, Superior Engine Division, National Supply Co.; treasurer: **Robert L. Camping**, project engineer, Aeroproducts Division, GMC; secretary: **William D. Hazlett**, executive engineer, chief draftsman, Aeroproducts Division, GMC.

Detroit

Chairman: **Vincent C. Young**, chief engineer, Wilcox-Rich Division, Eaton Mfg. Co.

Vice-chairman: **Robert Insley**, vice-president, chief engineer Continental Motors Corp.; vice-chairman Aeronautics: **John C. Squiers**, partner, Kelley, Soellner & Squiers, Inc.; vice-chairman, Body: **James H. Wernig**, assistant chief engineer, Fisher Body Division, GMC; vice-chairman, Junior Student: **Richard B. Sneed**, research engineer, Ethyl Corp.; vice-chairman, Passenger Cars: **L. Irving Woolson**, factory manager, DeSoto Division, Chrysler Corp.; vice-chairman, Production: **Kenneth R. Herman**, vice-president, manager, Vickers, Inc.; vice-chairman, Regional: **C. D. McCall**, installation engineer, New Departure Division, GMC; vice-chairman, Saginaw Valley: **Earl R. Wilson**, resident engineer, Chevrolet Motor Division, GMC; vice-chairman, Truck & Bus: **Valentine Y. Tallbert**, engineer, Ford Motor Co.; treasurer: **F. W. Marschner**, western sales manager, New Departure Division, GMC; secretary: **John J. Wharam**, chief automotive engineer, Ford Motor Co.

Hawaii

Chairman: **Arthur F. Wallace**, factory superintendent, Waiialua Agricultural Co., Ltd.

Vice-chairman: **John G. Brittain**, head fuel and lubricant engineer, Standard Oil Co. of Calif.; vice-chairman, Aeronautics: **Robert L. Campbell**, vice-president, Andrew Flying Services, Inc.; vice-chairman, Hawaii: **John W. Rogers**, Hilo branch manager, Continental Trailer & Equipment Co.; vice-chairman, Maui: **Hollis A. Hardy**, assistant manager, Maui Motors; treasurer: **B. J. Eaves**, general manager, Coca-Cola Bottling Co.; secretary: **William B. Meredith**, consulting engineer, Continental Trailer and Equipment Co.

Indiana

Chairman: **Karl H. Effman**, supervisor, engineering testing, Perfect Circle Co.

Vice-chairman: **William S. Powell**, vice-president, Laboratory Equipment Co.; treasurer: **A. W. Putnam**, research engineer, L.G.S. Spring Clutch Corp.; secretary: **Robert P. Atkinson**, turbine engineer, Allison Division, GMC.

Kansas City

Chairman: **W. H. Hooper**, division engineer (Indiana), Phillips Petroleum Co.

Vice-chairman: **Whitney M. Kerr**, sales manager, Moore Co.; vice-chairman, Aeronautics: **Gus A. Seidel**, senior engineer, maintenance department, Transcontinental & Western Air, Inc.; vice-chairman, Fuels & Lubricants: **Robert A. Walker**, superintendent, aircraft engineering, Transcontinental & Western Air, Inc.; treasurer: **Charles J.**

Officers . . .

Stuck, engineer, E. S. Cowie Electric Co.; secretary: William E. Breece, branch manager, Pacific Automotive Corp.

Metropolitan

Chairman: William E. Conway, assistant director, National Accounts Division, Studebaker Corp.

Vice-chairman: Jack O. Charshafian, project engineer, Wright Aeronautical Corp.; vice-chairman, Aeronautics: Robert A. Cole, project engineer, Wright Aeronautical Corp.; vice-chairman, Aircraft: J. M. VanLaw, operations schedule coordination, Pan American World Airways; vice-chairman, Diesel Engines: Richard Creter, service engineer, Rogers Diesel & Aircraft Corp.; vice-chairman, Fuels & Lubricants: George H. Keller, project engineer, Wright Aeronautical Corp.; vice-chairman, Passenger Cars: Denver F. Geisey, sales representative, Studebaker Sales Corp.; vice-chairman, Student Activity: Robert R. Templeton, project engineer, installation engineering, Wright Aeronautical Corp.; vice-chairman, Transportation & Maintenance: J. Howard Pile, business manager, Fleet Owner; treasurer: Richard C. Long, eastern sales representative, Warner Electric Brake Mfg. Co.; secretary: Kenneth Kasschau, project engineer, Wright Aeronautical Corp.

Mid-Continent

Chairman: Enos W. Cave, research engineer, Continental Oil Co.

Vice-chairman: Baxter I. Scoggin, Jr., manager, research and development, Anderson-Prichard Oil Corp.; vice-chairman, Transportation & Maintenance: Raymond G. Hilligoss, manager, Bartlesville Bus Co.; treasurer: Roy E. Edwards, research and development engineer, Halliburton Oil Well Cementing Co.; secretary: George W. Cupit, Jr., state chemist, Corporation Commission State of Oklahoma.

Milwaukee

Chairman: Charles T. O'Harrow, assistant chief engineer, West Allis Tractor Division, Allis Chalmers Mfg. Co.

Vice-chairman: E. E. Bryant, vice-president, treasurer, Nelson Muffler Co.; treasurer: G. J. Haislmaier, sales manager, Contract Products Division, Young Radiator Co.; secretary: Gene D. Sickert, chief engineer, Bolens Products Co.

New England

Chairman: F. W. Smith, New England manager, D. A. Stuart Oil Co., Ltd.

Vice-chairman: Robert Gardner, manager, automotive department, Lever Brothers Co.; vice-chairman, Aeronautics: Irwin F. Richardson, application engineer, General Electric Co.; vice-chairman, Truck & Bus: William H. Head, Sr., automotive superin-

tendent, Public Service Co. of N. H.; vice-chairman, Diesel Engines: Lewis B. Ebbs, zone parts and service manager, GMC Truck & Coach Division; vice-chairman, Fuels & Lubricants: Albert Lodge, president, Goodrich Oil Sales Co., Inc.; vice-chairman, Passenger Cars: Alfred Markus, treasurer, Markus Motor Service, Inc.; vice-chairman, Students: Arnold R. Okuro, instructor in charge of automotive department, Franklin Technical Institute; vice-chairman, Transportation & Maintenance: Neal E. Bogren, president, Waltham Automotive Corp.; treasurer: J. D. Works, district manager, Tek Bearing Co.; secretary: William F. Hagenloch, president, general manager, Lenk, Inc.

Northern California

Chairman: Charles A. Winslow, president, Winslow Engineering Co.

Vice-chairman: R. Wayne Goodale, assistant manager, product acceptance department, Standard Oil Co. of Calif.; vice-chairman, Aeronautics: Harry N. Taylor, project engineer, powerplants, United Air Lines, Inc.; vice-chairman, Diesel Engines: Elton B. Fox, engineer, Atlas Imperial Diesel Engine Co.; vice-chairman, Fuels & Lubricants: Carl W. Spring, technical assistant manager, lubricants department, Shell Oil Co., Inc.; vice-chairman, Transportation & Maintenance: Henry E. Jordan, assistant to vice-president, engineering, Key System; treasurer: Richard W. Muchmore, engineer, Federal Mogul Corp.; secretary: William G. Nostrand, chief engineer, Winslow Engineering Co.

Northwest

Chairman: D. D. Thomasson, lubrication engineer, State of Washington, Texas Co.

Vice-chairman: Murray Aitken, plant manager, Kenworth Motor Truck Corp.; vice-chairman, Tacoma: Newton J. Buren, manager, Tsungani Piston Co.; treasurer: Paul P. Olson, industrial lubricants engineer, General Petroleum Corp. of Calif.; secretary: Russell E. Fleischer, district manager, Colyear Motor Sales Co.

Oregon

Chairman: Howard H. Morse, assistant manager, Tracey & Co., Inc.

Vice-chairman: Earl B. Richardson, acting superintendent of equipment, Portland Traction Co.; vice-chairman, Students: W. H. Paul, professor of automotive engineering, Oregon State College; treasurer: Frank Costanzo, automotive engine specialist; secretary: A. M. Perley, district sales manager, Tide Water Associated Oil Co.

Peoria

Chairman: Dr. Richard Wiebe, U. S. Department of Agriculture, Northern Regional Research Laboratory.

Vice-chairman: Richard S. Frank, super-

ABOUT SECTION CHAIRMEN

Section Chairmen for 1946-1947 will be introduced to SAE JOURNAL readers in groups of three or four during the next twelve issues.

Field Editors in each Section soon will be busy gathering facts about each of these local leaders . . . their jobs, methods of operating, hobbies, interests, and vital statistics. Fresh, new pictures are being sought, along with the biographical material. Editorial aim is to give you two or three hundred interesting words about each chairman before the next Section year is ended.

Watch for this new feature.

intendent, general engine design, Caterpillar Tractor Co.; treasurer: Carl L. Kepner, designer, Caterpillar Tractor Co.; secretary: Ralph J. King, research engineer, Caterpillar Tractor Co.

Philadelphia

Chairman: John G. Moxey, Jr., assistant chief engineer, automotive section, development division, Sun Oil Co.

Vice-chairman: E. Robert Kinnebrew, branch manager, White Motor Co.; vice-chairman, Aircraft: Walter H. Pearson, engineer, in charge of transmission control rotors, Kellett Aircraft Corp.; vice-chairman, Fuels & Lubricants: A. L. Clayden, experimental engineer, Sun Oil Co.; vice-chairman, Transportation & Maintenance: Linn Edsall, general superintendent, transportation division, Philadelphia Electric Co.; treasurer: Parry H. Paul, technical service engineer, Autocar Co.; secretary: C. H. Van Hartesveldt, senior chemical engineer, Atlantic Refining Co.

Pittsburgh

Chairman: Norman H. Werner, manager, Ed Werner Transfer & Storage Co.

Vice-chairman: Wallace Hallam, district manager, Mack International Motor Truck Corp.; vice-chairman, Oil City: D. G. Proudfoot, manager, sales engineering department, Pennzoil Co.; treasurer: C. E. Chambliss, Jr., zone manager, fleet division, General Motors Corp.; secretary: Charles W. Woods, coordinator of transportation, West Penn Power Co.

St. Louis

Chairman: Carl H. Mueller, assistant to president, in charge of research and development, Lincoln Engineering Co.

Vice-chairman, Aeronautics: Kendall Perkins, project engineer, McDonnell Aircraft Corp.; vice-chairman, Diesel Engines: A. J. Minges, test engineer, Busch-Sulzer Bros. Diesel Engineering Co.; vice-chairman, Fuels & Lubricants: John W. Newcombe, technical representative, petroleum chemistry department, Monsanto Chemical Co.; vice-chairman, Springfield District: John T. Liggett, assistant chief engi-

SEPTEMBER 11-12



Hotel Schroede
Milwaukee, Wis.

SAE National TRACTOR MEETING

WEDNESDAY, SEPT. 11

Morning

Power Driven Machinery

J. R. Mohlie, Chairman

Power Requirements of P.T.O. Driven
Combines

- Prof. G. W. McCuen, Ohio
State University

Discussion: W. H. Worthington,
John Deere Tractor Co.

Power Requirements of Self Pro-
pelled Implements

- John Borland, Clark Equipment
Co.

Equipment for Separately Measur-
ing Power

- C. H. Gibbons, Baldwin Loco-
motive Works, Dr. A. C. Ruge,
Ruge, de Forest and Dr. J. H.
Meier, Bucyrus Erie Co.

Discussion: Sherman Heth, J. I.
Case Co. and Frank Tatnall

Luncheon

Noon

Afternoon

Tractor Mounted Equipment

Prof. E. W. Lehman, Chairman

Current Influences of Mounted or
Integral Equipment

- K. W. Anderson, Deere & Co.

Load Reactions, Weight Transfer
and Operational Effects

- D. C. Heitshu, Harry Ferguson,
Inc.

Tractors with Facilities for Equal
Forward and Reverse Operation

- A. W. Turner, U. S. Department
of Agriculture

Question Period Panel: C. E. Ever-
ett, Massey Harris Co., T. H.
Oppenheim, New Idea, Inc., Mar-
tin Ronning, Minneapolis-Moline
Power Implement Co., H. D.
Hume, H. D. Hume Co., and
George Kriegbaum, International
Harvester Co.

Milwaukee Section Golf Party on Friday, Sept. 13

THURSDAY, SEPT. 12

Morning

Tractor Draw Bar Pull

E. F. Norelius, Chairman

Tractor Efficiency

- C. T. O'Harrow, Allis-Chalmers
Traction as Influenced by Soils and
Their Condition

- A. D. Elliott and W. A. Gross,
Aberdeen Proving Ground

Discussion: H. E. Churchill, Stude-
baker Corp., Paul Huber, Gen-
eral Motors Corp., and W. D.
Jones, B. F. Goodrich Co.

Luncheon

Noon

Afternoon

Diesels

B. G. Van Zee, Chairman

Diesel Engine Requirements for
Farm Tractor Use

- L. A. Gilmer, Oliver Corp.

Economics of Diesel Power for Farm
Tractors

- H. F. Bryan, International Har-
vester Co.

Discussion: Russell Williams, Cater-
pillar Tractor Co., and F. G.
Shoemaker, General Motors

The Development and Application
of Air-Cooled Diesel Engines

- James Hoiby, D. W. Onan &
Sons

Question Period Panel: A. W. Pope,
Waukesha Motor Co., Harold
Smith, Buda Co., O. D. Treiber,

Hercules Motors Corp., and Earl
Ginn, Continental Motors Corp.

■ DINNER - 7 P. M. ■

E. A. Petersen, Chairman

Arch Colwell, Toastmaster

SAE President L. Ray Buckendale

FOWLER McCORMICK, Interna-
tional Harvester Co.

neer, Allis-Chalmers Mfg. Co.; vice-chair-
man, Transportation & Maintenance: Paul J.
Reese, automotive engineer, Wagner Elec-
tric Corp.; treasurer: John A. Wich, engineer,
Busch-Sulzer Bros. Diesel Engineering Co.;
secretary: Leroy W. Griffith, senior research
engineer, Shell Oil Co., Inc.

Southern California

Chairman: R. W. Cochrane, branch man-
ager, White Motor Co.

Vice-chairman: L. D. Bonham, materials
and department manager, Lockheed Aircraft
Corp.; vice-chairman, Aircraft: Carleton E.
Stryker, west coast representative, Bendix
Aviation Corp.; vice-chairman, Aircraft En-
gines: Don Parkin, west coast representative,
Continental Motors Corp.; vice-chairman, Air
Transport: Ralph L. Ellinger, senior engine-
ering representative, Transcontinental &
Western Air, Inc.; vice-chairman, Fuels &
Lubricants: B. T. Anderson, research chem-
ist, Union Oil Co. of Calif.; vice-chairman,
Passenger Cars: T. A. O'Connor, assistant to
vice-president, Studebaker Pacific Corp.; vice-
chairman, Production: H. Albert Jones, chief
engineer, H. L. Harvill Mfg. Co.; vice-
chairman, San Diego: Frank W. Fink, chief
division engineer, San Diego Division, Con-
solidated Vultee Aircraft Corp.; vice-chair-
man, Transportation & Maintenance: Lt. Col.
L. L. Beardslee; treasurer: Fred Patton, man-
ager, Los Angeles Motor Coach Lines; sec-
retary: Robert L. Johnson, garage superin-
tendent, department of public works, City
of Los Angeles.

Southern New England

Chairman: Kenneth F. Thomas, manu-
facturer's representative, bearings and allied
precision products.

Vice-chairman: David E. Waite, sales en-
gineer, Wallace Barnes Co.; vice-chairman,
Aeronautics: Richard C. Molloy, technical
chairman, wind tunnel laboratory, United
Aircraft Corp.; treasurer: Henry J. Fischbeck,
supervisor, metallurgical and chemical pro-
cessing, Pratt & Whitney Aircraft, division of
United Aircraft Corp.; secretary: Claude O.
Broders, designer, Pratt & Whitney Aircraft,
division of United Aircraft Corp.

Syracuse

Chairman: John D. Williams, vice-presi-
dent, general manager, Lipe-Rollway Corp.

Vice-chairman: John L. Collins, assistant
general manager, New Process Gear Corp.;
vice-chairman, Southern Tier: Samuel K.
Wolcott, Jr., engineer, in charge of engines
and pumps, American LaFrance Foamite
Corp.; treasurer: Carl T. Doman, vice-presi-
dent, chief engineer, Aircooled Motors Corp.;
secretary: Thomas B. Frame, senior service
engineer, Aircooled Motors Corp.

Texas

Chairman: S. V. Jay, manager, railroad
sales and service, lubricants engineer, Hum-
ble Oil & Refining Co.

Vice-chairman: Floyd Patras, manager of
maintenance, Southwestern Greyhound Lines,
Inc.; vice-chairman, Harry A. Sheridan, as-
sistant service manager, Guiberson Diesel En-
gine Co.; treasurer: Ross A. Peterson, super-
visor of instruction, Dallas Vocational
School; secretary: James W. Walker, director,
Walker Laboratories.

Twin City

Chairman: Carl R. Reller, experimental
turn to p. 33

continued from p. 32

engineer, Minneapolis Moline Power Implement Co.

Vice-chairman: **T. C. Hendrickson**, division lubricant engineer, Pure Oil Co.; treasurer: **Thomas Murphy**, assistant professor of mechanical engineering, University of Minnesota; secretary: **J. C. Hoiby**, chief engineer, D. W. Onan & Sons.

Washington

Chairman: **Alvan A. Gloetzner**, manager, Washington branch, New Departure Division, GMC.

Vice-chairman: **Hoy Stevens**, in charge of equipment and maintenance, American Trucking Associations, Inc.; vice-chairman, Norfolk District: **Henry J. E. Reid**, engineer in charge, National Advisory Committee for Aeronautics; treasurer: **Clarence S. Bruce**, automotive engineer, National Bureau of Standards; secretary: **E. K. Owens**, field engineer, tire engineering and service department, U. S. Rubber Co.

Western Michigan

Chairman: **Douglas W. Hamm**, product engineer, Muskegon Piston Ring Co.

Vice-chairman: **Paul W. Fuller**, project engineer, Continental Motors Corp.; treasurer: **G. Wayne Thomas**, executive engineer, Continental Motors Corp.; secretary: **Harold N. Myers**, chief metallurgist, Sealed Power Corp.

Wichita

Chairman: **Tom Salter**, chief engineer, Cessna Aircraft Co.

Vice-chairman: **Andrew S. Swenson**, owner, Swenson Motor Co.; treasurer: **Marvin J. Gordon**, aerodynamics engineer, Beech Aircraft Corp.; secretary: **Dean E. Burleigh**, project engineer, engineering department, Beech Aircraft Corp.

Colorado Group

Chairman: **Lars O. Prestrud**, Cummins-Diesel Sales of Colorado, Inc.

Vice-chairman: **Merle J. Webber**, sales-service engineer, Central Supply Co.; secretary: **Richard S. Arnold**, owner, Kwickway Tool Co.

Mohawk-Hudson Group

Chairman: **Laurens A. Taylor**, aeronautical equipment section, aeronautical and marine engineering division, General Electric Co.

Vice-chairman: **Raymond D. Mires**, product design engineer, A & M Engineering Department, General Electric Co.; secretary-treasurer: **Robert H. Craig**, sales manager, Albany Garage & Appliance Distributors, Inc.

Salt Lake Group

Chairman: **E. R. Donner**, fuels and lubricants engineer, Standard Oil Co. of Calif.

Vice-chairman: **C. E. Smith**, garage foreman, Burlington Transportation Co.; secretary-treasurer: **David Brown**, parts department manager, Cummins Intermountain Diesel Sales Co.

Spokane Group

Chairman: **Hugh P. Kanehl**, fleet superintendent, Inland Motor Freight.

Vice-chairman: **George A. Jackman**, superintendent of maintenance, United Truck Lines, Inc.; treasurer: **O. M. Fahey**, automotive electrician; secretary: **William B. Keith**, service manager, Spokane Kenworth Co.

SAE National

TRANSPORTATION and MAINTENANCE MEETING

Oct. 16-17

WEDNESDAY, OCTOBER 16

Morning

E. N. Hatch, Chairman

The Dynamometer as an Aid in Fleet Maintenance

Manufacturer—

—Paul Oberreuter, Mid-West
Dynamometer & Engineering
Co.

Operator—

—F. C. Patton, Los Angeles
Motor Coach Lines

Afternoon

E. P. Gohn, Chairman

Symposium on Automotive Space Heaters

Fresh Air Automotive Heating: Influence of Aviation Industry

—L. A. Rodert, South Wind Division, Stewart Warner Corp.

Automotive Space Conditioning

—E. T. Todd, General Motors
Coach Division

Evening

DINNER

O. A. Brouer, Toastmaster

Observations on Automotive Equipment in Germany
—Austin M. Wolf, Consultant

THURSDAY, OCTOBER 17

Morning

W. A. Taussig, Chairman

Light Weight Bodies for Trucks and Trailers

Light Weight Bodies of Aluminum
—F. O. Lewis, Dayton Power & Light Co.

Aluminum and Magnesium in Bodies
—J. H. Dunn, Aluminum Co. of America

Motor Haulage Bodies of Stainless Steel
—V. M. Drew, Fruehauf Trailer Co.

Afternoon

D. K. Wilson, Chairman

Tire Maintenance

Present-day Truck Tire Maintenance
—Ben Sorci, Sorci & Bryant

Prepared Discussion

Virginia Group

Chairman: **H. B. Truslow**, proprietor, Richmond Auto Parts Co.

Vice-chairman: **L. W. Bingham**, owner, Bingham Truck Service; treasurer: **E. Govan Hill**, president, Automatic Shifter, Inc.; secretary: **Paul R. Lauritzen**, president, Lauritzen Motors, Inc.

Williamsport Group

Chairman: **Albert L. Brucklacher**, service engineer, Lycoming Division, Aviation Corp.

Vice-chairman: **Walter C. Jamouneau**, chief engineer, Piper Aircraft Corp.; treasurer: **G. Allan Creighton**, special problems engineer, Lycoming Division, Aviation Corp.; secretary: **W. H. McQuiston**, experimental test engineer, Lycoming Division, Aviation Corp.

Vendors, Users Agree

RECONCILED at the last meeting of the SAE Copper Alloy Products Committee of the Aeronautical Material Specifications Subdivision were the conflicting viewpoints of suppliers, as represented by interested vendors and guests from the Copper and Brass Research Association, and users, as represented by the committee members.

Matters discussed concerned basic questions on the technical content of copper alloy specifications and various modifications proposed. Changes agreed upon at this meeting will be circulated among producers and users. Proposals favored with general acceptance will be reflected in forthcoming revisions to the appropriate AMS.

The next committee meeting is to be held in Cleveland, during the Semi-Annual Aeronautic Meeting, Aug. 26-30, 1946.

Private Flying Vistas Widened By New SAE Standards Group

CHARACTERISTIC of the SAE technical committee activity shift from war to peace problems is creation of the Personal Airplane Accessories & Equipment Standardization-Steering Committee for solution of standardization problems to increase utility of the personal airplane.

Safety and economy are underlying reasons for the extensive standardization program planned on items peculiar to the personal airplane. Prime function of the new Steering Committee, under the chairmanship of W. C. Jamouneau, Piper Aircraft Corp., is to guide and direct related standardization activities of the various specialized committees of the Accessories and Equipment Sub-division of the SAE Aeronautics Committee.

Need for standardization of personal aircraft items stems from the lack of integrated activity in this field which now faces rapidly accelerated growth—but not without inherent public resistance to high costs and lack of performance dependability. Standardization efforts of the Committee will, it is hoped, reduce initial aircraft cost and day-to-day maintenance as well as increase flying safety.

Committee members agree that emphasis should be placed on the development of performance requirements in general rather than dimensional or envelope standards. In cases such as batteries, brakes, and wheels, however, a dimensional standard is desirable. As a general criterion, items considered for standardization will be internal—not readily visible. Through this approach, variations in styling and design will be permitted, allowing for maximum ingenuity and customer appeal through distinctive design.

Emphasized by the Committee with respect to its operations is the distinct difference between problems of standardization of personal airplane accessories and equipment and similar problems related to military aircraft. For example, as opposed to thinking prevalent in preparation of standards for military aircraft, the cost factor for the personal airplane is not negligible, but of prime importance. Factors to be submitted to the various specialized committees for considera-

tion in personal aircraft projects are, in order of their importance:

1. Initial cost,
2. Performance,
3. Weight, and
4. Ease and cost of maintenance.

Another practical consideration in developing standards is availability, as a standard for an item that is not available is useless. Size and appearance, too, are worth pondering.

Still another aspect of equipment standardization is the possible need for an environmental specification covering the requirements of the personal airplane. Preliminary discussions revealed the following factors as being of some consequence:

- Temperature limits and rate of change,
- Pressure limits and rate of change,
- Moisture exclusion,
- Dust exclusion,
- Vibration, and
- Impact.

Accessories and equipment requiring standardization which are to be referred to appropriate working committees are: oil coolers, wheels and brakes, storage batteries, instruments for both contact and instrument flying, hydraulic actuators, and aircraft lights.

Operational Functions

Policywise, the Committee established, at its initial meeting on June 14 in Detroit, the following as a statement of its scope and functions:

- a. To make a study and analysis of the problems of standardization of accessories and equipment for personal airplanes and determine what projects should be undertaken by the SAE committees;
- b. To maintain a liaison with the National Aircraft Standards Committee and to expedite the handling of projects by specialized SAE committees on items in which airplane manufacturers think standardization should be effected;
- c. To review projects originating in specialized SAE committees and to expedite their handling or to insure that

such standards and specifications as may be developed by other committees place proper emphasis on the specialized requirements applying to the personal airplane, and

- d. To promote the development of a statement or an understanding, with the aid of the NASC, of the minimum requirements applicable to accessories and equipment for personal airplanes.

The relationship of the SAE and the NASC regarding respective areas of operation followed during the war, will be continued in peacetime standardization work. Under this arrangement, the NASC will carry on industry standardization work in the field of airframe structures, components, and various items such as standard parts and hardware used in the airframe. The NASC will also handle standardization of powerplant and accessory installation.

The SAE will continue its work in the field of design and dimensional standardization work affecting aircraft engines, propellers, and accessories as well as materials and processes used in these components and the airframe.

Serving with Chairman Jamouneau on the SAE Committee are D. C. Romick, Taylorcraft Aviation Corp.; J. E. Glover, Republic Aviation Corp.; G. Zahn, Stewart-Warner Corp.; E. M. Scott, Scott Aviation Corp.; R. Hermes, Aeronca Aircraft Corp., and A. Urfer, Aeromarine Instrument Corp.

Plan Standardization Of Aero Engine Studs

AIRCRAFT engine manufacturers, airline operators, and the military services can now look forward to the possibility of stud standardization as the result of a new program undertaken by SAE Committee E-26, Screw Threads and Threaded Fastenings.

The industry has found particularly useful ARP 142, Stud Fits and Tolerances (Steel in Aluminum or Magnesium Alloys) prepared by the Committee. Committee members now feel that they can render a still greater service by taking the next step in stud standardization—the standardization of stud dimensions.

Stud standardization would benefit the engine manufacturer by enabling him to standardize on studs used in all his engines, eliminating special studs. This program would be most advantageous to the military services. Instead of carrying in stock the studs used by each of the manufacturers for each type of engine as is now necessary, it will be possible to stock only one class of stud in standard sizes and oversizes. Simplification of the stud stocking problem is also desirable in airline maintenance.

Contemplated by the conferees in their preliminary plans are the standardization of four types of studs, namely: the straight, the semi-necked, and full-necked, and the full-necked with a wrench flat at the stud end.

Proposals are to be drafted on these four types of studs in sizes $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, and $\frac{7}{16}$, incorporating all linear dimensions of the stud. Also to be prepared is a proposal for standard pitch diameters for standard and oversize studs based on the recommendations contained in ARP 142. This proposal will also include the thread length at the stud end.



Newly created personal aircraft standards group launched an extensive program at its initial meeting. Seated, left to right are: M. L. Stoner, SAE Staff; J. E. Glover, Republic Aviation Corp.; W. O. Stone, Jr., Taylorcraft Aviation Corp.; D. C. Romick, Taylorcraft Aviation Corp.; R. Hermes, Aeronca Aircraft Corp.; Chairman W. C. Jamouneau, Piper Aircraft Corp.; J. D. Redding, SAE Staff; B. R. Teree, The Weatherhead Co.; E. M. Scott, Scott Aviation Corp.; G. Zahn, Stewart-Warner Corp., and L. A. Majneri, Warner Aircraft Corp.

Find Novel Uses For Conductive Rubber

RUBBER, the material which for years was one of the best electrical insulators known, can now be made a conductor of electricity.

In the late 30's it was found that by compounding acetylene black into rubber, a soft rubber could be made to conduct an electric current and still maintain the other normal rubber characteristics such as tensile strength, elongation, and hardness. In recent years many conductive channel type carbon blacks have also been developed which are used extensively by the rubber industry.

Conductive rubber has found many applications in industry as a means of eliminating static discharges. In past years many disastrous explosions and fires have been caused by an electrostatic discharge built up by a moving belt. In flour mills and grain elevators the use of electrically conductive rubber elevator, transmission and conveyor belts will practically eliminate this hazard. Most of us have also noticed the soft rubber nozzle used on many gasoline dispensing pumps at filling stations. These, too, were made from conductive synthetic rubber to eliminate the possibility of a static spark igniting the gasoline vapor when the nozzle is withdrawn from, or inserted into the tank. For safety, it is necessary to use either a metal nozzle or one of conductive rubber, and as drivers object to having the filling station attendant bang their car with a metal nozzle, the rubber one is widely used.

Many bus passengers will recall receiving an electric shock of varying intensity when boarding a bus immediately after it had stopped. This condition was first corrected by using a light weight strap of conductive rubber attached to the under side of the bus so that when it was in motion the air stream lifted it off the road, but as soon as the bus slowed down the strap would contact the road surface sufficiently to discharge the static charge developed in or on the moving bus.

Later, tires with conductive sidewalls and tread were developed and today they are standard equipment on practically all rubber-tired public conveyances.

During the war, conductive rubber was used for matting, belting, truck tires, shoe soles, and many other items in munition plants, and it no doubt contributed much toward the low accident rate in munition production.

More recently conductive rubber has been used directly as a heating element. Some applications are ice eliminators on the leading edge of aircraft propellers, heating pads, and even baby chick brooders.

Theoretically, conductivity in a rubber compound is secured by actual contact of the carbon black particles. We believe this is so for the following reasons:

a) If a conductive rubber strip is stretched its conductivity is reduced, and inversely if it is compressed its conductivity is increased.

b) In order to secure the best physical properties in a rubber compound, such as tensile strength, elongation, et cetera, the carbon black and other materials must be well distributed (dispersed) to eliminate agglomeration. Within limits, the better the milling process, the better the physical properties. But with electrical conductive rubber, the more the compound is milled (in the

SAE National Meeting

TRANSPORTATION and MAINTENANCE

New Washington Hotel
Seattle, Wash.

AUG. 22-24

<p>THURSDAY, AUG. 22</p> <p style="text-align: center;">Morning</p> <p>William Nunnenkamp, Chairman Passenger Cars Wallace Linville, Acelin Co.</p> <p style="text-align: center;">Afternoon</p> <p>L. J. Love, Chairman Automatic Transmissions O. H. Banker, New Products Corp. Discussion: R. E. Thompson, Western Gear Wks.</p> <p>N. J. Buren, Chairman Engines J. M. Shoemaker Discussion: Errol Gay, Ethyl Corp.</p> <p>FRIDAY, AUG. 23</p> <p style="text-align: center;">Morning</p> <p>James Ray, Chairman Bearings R. A. Watson and W. E. Thill Federal Mogul Corp.</p>	<p>Gerthal French, Chairman Lubricants Dr. C. E. Emmons, The Texas Co. Discussion: Jack Shaylor</p> <p>Industrial Tours Afternoon</p> <p>SATURDAY, AUG. 24</p> <p style="text-align: center;">Morning</p> <p>T. S. White, Chairman Logging Trucks J. C. Sheasgreen, Comox Logging & Railway Co. Discussion: J. G. Holmstrom, Kenworth Motor Truck Corp.</p> <p>S. H. Hawley, Chairman Buses Phil Schrod, B. C. Motor Transportation, Ltd. Discussion: H. E. Simi, Kenworth Motor Truck Corp.</p> <p style="text-align: center;">Afternoon</p> <p>Golf, etc.</p> <p style="text-align: center;">Evening</p> <p>Bill Miller, Chairman L. Ray Buckendale Dinner & Dance</p>
--	---

uncured state), the poorer are its electrical conductive properties.

c) We also know that in calendering (sheeting) a rubber compound there is produced a grain effect. The tensile strength and elongation are different when tested lengthwise and crosswise of the sheet. The same phenomenon is present with electrical conductive rubber. The sheet has greater conductivity lengthwise than it has crosswise or through the sheet.

All of the above factors make it very difficult, if not impossible, to use exact electrical conductive specifications to cover the application and use of articles made of conductive rubber.

It has been found that when a rubber compound possesses enough conductivity to cause a two watt neon bulb to glow when a 110 volt a-c current is passed through it, the rubber is sufficiently conductive to eliminate or dissipate static electricity when

such a compound is used in items such as transmission belts, conveyor belts, matting, sand blast hose, tires, et cetera.

In the past, conductive rubber has been used almost exclusively for the dissipation of static electric charges, but recent developments indicate that the versatile materials, rubber and synthetic rubbers, may find new fields of application.

In anticipation of its increased use, a committee has been formed to study means of determining the conductivity or resistivity of conductive rubber and to propose specification limits that are commercially practical.

The committee is a Sub-section of Section IV of Technical Committee A, a joint committee of the Society of Automotive Engineers, Inc., and the American Society for Testing Materials. Mr. Sherman R. Doner of Raybestos-Manhattan, Inc., Passaic, New Jersey, is chairman of the Sub-section on Conductive Rubber.

Tire Problems Probed For Tractor Industry

SINCE the lifting of tire restrictions following the end of the war during which the Tractor War Emergency Committee served the Rubber Director's office of the WPB in matters pertaining to mandatory tire restrictions, the Tractor Technical Committee, successor to the TWEC, has functioned in an advisory capacity to the Tire and Rim Association and the Rubber Manufacturers Association in matters pertaining to a simplified tractor tire and rim program.

Latest addition to the agenda of TTC projects is the standardization of wheel mountings. TTC members agree that the tire simplification program cannot make much progress until the basic question of wheel standardization has been worked out.

Elmer McCormick, John Deere Tractor Co.'s chief engineer and TTC sponsor of the wheel mounting project, together with L. B. Neighbour, Deere & Co. engineer and chairman of the wheel mounting sub-committee, are enthusiastic over the cooperative response received from the engineers in the tractor and wheel industry. Technicians from the following companies attended the first sub-committee meeting: Allis-Chalmers Mfg. Co.; J. I. Case Co.; Electric Wheel Co.; French & Hecht Co.; Graham-Paige Motors Corp.; Harry Ferguson, Inc.; International Harvester Co.; Massey-Harris Co.; Minneapolis-Moline Power Implement Co.; Motor Wheel Corp.; New Idea Corp., and The Oliver Corp.

The sub-committee will consider the standardization of 12, 15, 16, 18, 20, 24 and 30-in. rims, but as a starter will concentrate its efforts within the 16-in. range. Data will be turned over to the wheel company engineers and the compilation and report of the wheel companies forwarded to all tractor engineers for study.

Wheel mounting problems are so closely related to the tire simplification program that both projects in all probability will be handled by the same sub-committee.

The study of front tractor tire simplification on an experimental basis is continuing. H. W. Delzell, B. F. Goodrich Co., consultant to the TTC, announced that the rim manufacturers now have the new wider base experimental rims available for the wider base experimental tires to be used by tractor engineers in their test work.

Two tire sizes—the 9 x 42-in.—6-ply and the 11 x 42-in.—6-ply—were recommended for consideration in future designs of high clearance tires. The 42-in. tire was recommended over the 44-in. tire because there would be less loss of drawbar pull and speed and not as great an increase in cost.

Experience in cane fields indicates a tendency on the part of operators to oversize the tires when the tractors are received at the fields. The 10-38 and 11-38 were the oversizes considered for the standard 9.00-36 tire and 12-38 and 13-38 for the 11.25-36. The 13-38 size was dropped from consideration because of reports that they damage the roots of the crops. The tentative recommended practice for future cane field use, therefore, was the two sizes 11-38 and 12-38.

Rice field requirements are somewhat different than cane field and, accordingly, the tentative recommended practice for future design was 15-30 and 15-34 in place of 12.75-28 and 13.50-28.

Rambling Through Section

SUBSTANTIAL performance advantages are possible for light planes through the development of a foolproof, automatic variable pitch propeller, according to John D. Waugh, Koppers Co. Speaking before the June 11 meeting of **WILLIAMSPORT GROUP** on "Light Variable Pitch Aircraft Propellers," Mr. Waugh explained that this aim is accomplished through the utilization of natural forces acting on the blades to accomplish pitch change. He discussed slides which illustrated forces acting on a propeller, compared French, German and American automatic propellers, and illustrated the action of the "Aeromatic" propeller. In answer to a question, Mr. Waugh reported that up to the cruise "critical" altitude, the action of the Aeromatic propeller is fully automatic and proper pitch changes are made; beyond this point, there are no advantages over a fixed-pitch propeller. Asked whether the use of the Aeromatic propeller results in hunting of the engine rpm, he replied that after proper adjustments, the Aeromatic holds the engine rpm within ± 25 rpm limits. Crankshaft vibration characteristics are changed only slightly, he said, with very few failures resulting.



Shown at Philadelphia Section's May 8 meeting are seven Section chairmen: (l. to r.) Emile Gohn ('41-'42), John Moxey, Jr. ('46-'47), Frank Burk ('44-'45), Adolf Gelpke ('28-'29), Ted Hetzel ('45-'46), Ralph Strohl ('43-'44), and C. M. Billings ('42-'43).

"Plastics in Our World Today," presented by W. J. Connelly, Bakelite Corp., at the June 26 **PHILADELPHIA SECTION** meeting, surveyed the field from the earliest known history of anything classifiable as plastic, from the mysteries which ages ago puzzled scientists, to the array of plastic materials in practical use today. Properly handled, he said, these new synthetic materials exhibit outstanding properties never before obtained from any materials. While traditional structural materials are limited by their inherent characteristics, manmade plastics may be varied at will to meet requirements of almost any given situation. Plastics, he said, cannot be considered curealls, to replace wood, steel, glass and other materials, but should be looked upon as materials to enhance, augment and improve the properties of natural materials. For example, no window made of plastic alone or of glass alone possesses all the exceptional advantages of one of layers of glass and plastic.

"Design Considerations for Light Aircraft" was the topic of a joint meeting on June 6 of **SAN DIEGO DIVISION** and the San Diego Section of the Institute of the Aeronautical Sciences. Speakers were J. M. Gwinn, Jr., chief engineer, personal aircraft, of Consolidated-Vultee Aircraft Corp., and B. F. Raynes, tooling supervisor of Rohr Aircraft Corp.

Mr. Gwinn, who spoke on "The Application of Two-Dimensional Control Systems to Light Aircraft," stated that the difficulty with the present control system for aircraft is that it makes skill a requirement for safety, because of the six degrees of motion obtainable. Solution to the control problem, he believes, lies in reducing the complexity of control by eliminating unnecessary combinations of motions—that is, substantially, the substitution of a two-control system for the conventional three control (elevator, rudder and aileron) system. The two control airplane, he said, should have a tricycle landing gear in addition to being spinproof and stallproof.

Discussing "Light Plane Design Criteria," Mr. Raynes described a two-place side-by-side Canard type private plane, powered with a 65 hp engine, which has a landing speed of 40 mph, a maximum speed of 150 mph, and a weight of

Section Reports

only 495 lb empty. Advantages claimed are its excellent visibility and the absence of noise from the rear-installed engine. It is small enough to be stowed in a one-car garage or towed, wings folded, behind a car.

Three speakers were featured at the June 14 meeting of **SOUTHERN CALIFORNIA SECTION**. Lt.-Col. Lawrence J. Grunder, Section past-chairman, spoke on "My War Experiences in the European Theater." Colonel Grunder had a part in the Pyron-Paul agreement, standardizing on two fuel grades for the Armed Forces: 100 octane for the Air Forces and 80 octane for the Ground Forces. He was responsible for the Army's investment in portable laboratory equipment for petroleum, which was put to good use in Sicily where captured Italian and German petroleum stores were tested for Allied application. Slides showed how the enemy went underground to prepare fuel in Austria, with the aid of tunnels containing all the necessary equipment for refining fuels.

Speaking on "Petroleum Logistics in the Pacific—World War II," Capt. Philip D. Lohmann, U. S. Navy Board of Inspection and Survey, showed slides describing mid-ocean transfer of fuel and oil to fighting ships, told how both tender and fighting ships being fueled were on a constant alert during the fueling operations, with men stationed to cut the fuel lines the instant an enemy put in an appearance. Although fuel delivery and consumption was comparatively minute at the beginning of the War, he said, operations were increased several hundred percent during the last two years before V-J Day.

Difficulties were experienced from the start in organizing a Motor Shop Corps, Col. L. L. Beardslee stated in his "Report on Army Vehicles." Manpower was inexperienced, and a short range training program had to be initiated. Trained men were immediately transferred to other sections, he said, and were replaced with whatever help could be found—Arabs, French soldiers, and captured Italian soldiers.

Major problems in internal combustion engine development have been proper mixing of the explosive mixture with a vaporizer or carburetor, and the mechanism of ignition used, C. A. Winslow told **NORTHERN CALIFORNIA SECTION** at its June 11 meeting. Mr. Winslow, who is president of the Winslow Engineering Co., has surveyed the operations of over 40 engine builders on the West Coast, and from material gathered he discussed the historical development of the engines and illustrated the great variety of engines perfected on the West Coast.



Virginia Group's May 23 meeting was devoted to a discussion of brakes, wheels and transmissions. Speakers were J. V. Bassett, Manhattan Raybestos Co., and H. A. Schneider, Timken-Detroit Axle Co.

Fifty-two members attended **HAWAII SECTION'S** June 17 meeting. Visiting member W. V. Hanley, assistant manager of the Aviation Division of Standard Oil Co. of Calif., spoke on "Future Prospects for Personal Plane Flying (see p. 52). Mr. Hanley reported that Hawaii has been allocated \$5,000,000 of the \$500,000,000 airport appropriation bill recently signed by President Truman.

At **SYRACUSE SECTION'S** May 27 meeting, held in Willard Straight Hall on the Cornell campus, J. C. Gibb and A. R. Purdy, of the engineering staff of Socony-Vacuum Oil Co., presented with the aid of slides a paper on "Gears and Their Lubrication." Paper and the succeeding discussion dealt with fundamentals of operation of the various types of gears used in industry, requirements for a good gear lubricant, and analysis of different types of gear tooth failure as related to faulty materials and to improper or insufficient lubrication.

Beecroft Lecture Committee Formed

UPON approval by Council on June 5 of the SAE Past-Presidents Advisory Committee's recommendations for administering the \$2500 legacy bequeathed to the Society by the late Past-President David Beecroft, Pyke Johnson, president of the Automotive Safety Foundation, Washington, was appointed by President L. Ray Buckendale the SAE representative of the Beecroft Traffic Safety



Pyke Johnson

Engineering Lecture Committee. Mr. Johnson will serve as chairman of the group.

Conditions of administering the bequest, as reported to Council by Past-President Mac Short, chairman of the past-presidents group:

- Ten annual awards of \$250 each will be made to authors who "must have made a substantial contribution to the safety of traffic involving the use of motor vehicles, and must be willing to deliver a Memorial Lecture."
- The Memorial Lecture must be presented before a Section of the Society to be selected by Council.
- The Beecroft Traffic Safety Engineering Lecture Committee shall submit annually at least one report to the SAE Past-Presidents Advisory Committee, including a candidate or candidates for the next award. In case no candidate is named, a statement giving the reason will be made.
- The SAE General Manager will be responsible for making this report available to the Automobile Manufacturers Association, and that any AMA advice on this subject is transmitted to the Committee in line with Mr. Beecroft's desire that the AMA and SAE show their interest in promoting traffic safety.

Besides the SAE representative, nominations for members of the Committee will be made by the American Association of Motor Vehicle Administrators, Automobile Manufacturers Association, Automotive Safety Foundation, American Association of State Highway Officials, International Association of Chiefs of Police, and the Public Roads Administration. Representatives may be reappointed or changed each year according to the desire of the foregoing organizations.

News cont. on p. 43

Ford Names Engineering, Metallurgical Chiefs



Harold T. Youngren



R. H. McCarroll

HAROLD T. YOUNGREN has been named director of engineering and **R. H. MCCARROLL**, director of chemical and metallurgical engineering and research, of Ford Motor Co.

Mr. Youngren, once Oldsmobile's chief engineer, comes to Ford from Borg-Warner Corp., where he has been director of engineering since August, 1944. An SAE member for 34 years, he has played a prominent part in Society technical and administrative work. Last year he completed a two-year term as SAE Councilor.

Mr. McCarroll, who has been executive engineer at Ford, is a member of the SAE Technical Board, which directs all technical committee activities of the Society, and had an exceptionally active role in the SAE War Engineering Board during World War II.

Colonial Broach Co., Detroit, has appointed **WITOLD S. GWIZDOWSKI** to the post of mechanical engineer. He had held the same position with the Cleveland laboratory of the NACA.

ROBERT LOVELL has been elected a vice-president of the Nylok Corp., New York, formerly the Fibre Lock-Nut Corp. He had been supervisor of service engineering, Eastern Aircraft Division, General Motors Corp., Linden, N. J.

Now vice-president and secretary of Browne & Galpin, Inc., San Fernando, Calif., **FRANK S. GALPIN** recently resigned as a sales representative of Hamilton Standard Propellers Division, United Aircraft Corp., Los Angeles.

CHARLES MOHNEN, who had been a captain in the Army Air Forces and connected with the inspection office of the Air Technical Service Command, New York, has been appointed general manager of Hyfrod Service, Inc., Kearney, N. J. He had been with the Heyer Products Co., Inc., Belleville, N. J., as field engineer.

CHARLES L. TUTT, JR., has been appointed assistant to the director, General Motors Institute, Flint, Mich. He had previously been associate editor of *Product Engineering*, New York City.

JOSEPH F. LARWA has joined the Curtiss Airplane Division, Curtiss-Wright Aeronautical Corp., Columbus, having recently resigned as layout draftsman with National Supply Co., Springfield, Ohio.

WILLARD EDWIN CROTTY is now general manager and co-partner of Automotive Products Co., Jonesville, Mich., having resigned his position as assistant sales manager of Detroit Gasket & Mfg. Co.

Previously sales engineer with Columbia Aircraft Corp., Valley Stream, L. I., N. Y., **JOHN THOMAS LIPFORD** is now associated with Snead & Co., Orange, Va., as sales and estimating engineer on sheet metal products.

LUEN ON LEE has been appointed purchasing engineer by the Fu Chung International Corp., New York City, an importing and export concern. He had been an engineer with the Vimalert Co., Jersey City.

Mohawk Refining Corp., Newark, N. J., has appointed **ADELBERT M. CRITTENDEN** its chief chemist. He had been associated with Triplex Oil Refining Co., Long Island City, N. Y., in the same capacity.

LOUIS A. GRUTSCH, formerly general plant manager of the Oliver Co., Cleveland, is now with the Painesville Machine Co., Painesville, Ohio.

Now partner, designer and manager of The Boatbuilders, Chicago, **ROBERT MORRISON BERNIS** has left Van Nuys, Calif., where he had been president and chief engineer, Aircraft Marine Engineering Corp.

LAWRENCE M. ROSE has resigned from the NACA as a mechanical engineer in the Cleveland laboratory to join the General Electric Co., Schenectady, in a similar position.

About S

B. M. IKERT has been appointed technical editor of *Fleet Owner*. Having acted as technical consultant to many manufacturers in the industry, Mr. Ikert brings to the readers of *Fleet Owner* a wide background.

ALVAN MACAULEY, chairman of the board of Packard Motor Car Co., who had served 18 years as president of the Automobile Manufacturers Association until he resigned that post last February, was awarded the AMA Charles Clifton Award. In making the presentation, **C. E. WILSON**, president of General Motors Corp. and an AMA director, said in part . . . "You have been an inspiring leader in achieving automotive teamwork in the production of war materials in World War II. . . ." Mr. Macauley was the 16th automotive pioneer to receive the award, named in honor of the pioneer head of the industry's trade organization, and one-time chairman of Pierce Arrow.

The University of Akron has conferred upon **PAUL W. LITCHFIELD**, chairman of Goodyear Tire & Rubber Co., an honorary degree of doctor of science. Mr. Litchfield presented the commencement address.

Formerly vice-president of the Lord Manufacturing Co., Erie, **THOMAS LORD** has been elected president of the company to succeed his father, H. C. Lord, who becomes chairman of the board.

WILLIAM HARRIGAN has been appointed chief engineer of the automotive division, The Texas Co. Joining the company 20 years ago, he has been for several years consulting technologist. He has served on several SAE technical committees, including a transportation and maintenance group which made a report on "Engine Deposits: Prevention and Removal," of which more than 32,000 copies have been sold.



William Harrigan

SAE

Members

FLOYD JAMES HARTSHORN, JR., has been released from the Navy, in which service he was inspector of navy materiel at Cleveland, with the rank of lieutenant. He is now a field engineer for Timken Roller Bearing Co. at Milwaukee, Wis.

Discharged from the Navy, **JOHN L. HOOVEN** is a designer in the Ford Motor Co. Engineering Laboratory, Dearborn, Mich.

GEORGE G. HUGHES has returned to the Shell Oil Co., New York, after service as a captain in the U. S. Marine Corps, where he was assigned to the Naval Air Station, Ottumwa, Iowa.

R. DIXON SPEAS, formerly assistant to **WILLIAM LITTLEWOOD**, vice-president, engineering of American Airlines, Inc., has been appointed director of engineering and maintenance of the company's Contract Air Cargo Division, with headquarters at St. Joseph, Missouri. For several years a member of the Metropolitan Section's governing board, Mr. Speas served as the Section's chairman during 1945-46. He presented a paper on "Operating Cost Aspects of Airline Procedure," at the SAE Summer Meeting June 6. **E. W. FULLER**, until recently facilities planning engineer, succeeds Mr. Speas as assistant to Mr. Littlewood.



R. Dixon Speas

SENECA G. COON, JR., has recently become associated with the Research Division of Aerojet Engineering Corp., Azusa, Calif., and is engaged in the design and development of rockets and jet propulsion motors. Mr. Coon had previously been a designer of gasoline and diesel engines with Mack Mfg. Corp., Plainfield, N. J., and just prior to joining Aerojet was employed by Hawkins Engineering Laboratories, Fresno, Calif.

P. S. WEBSTER, previously product design engineer, Sealed Power Corp., Muskegon Heights, Mich., is now checker for the Muskegon engineering department, Continental Aviation & Engineering Corp.

FREDERICK RITZ, who had been vice-president in charge of diesel manufacturing, Hooven, Owen, Rentschler Division, General Machinery Corp., Hamilton, Ontario, is now with Nordberg Mfg. Co., Milwaukee, as superintendent.

Formerly general manager, Larsen Swallow Motor Co., Spokane, **HOMER L. ROUSE** is now engaged in sales and maintenance work as a partner of Rouse-Duchow Motors, Spokane.

WILLIAM S. ROLLO has become engineering assistant for the Atlantic Refining Co., Philadelphia.

Formerly group supervisor in charge of rotor blade and attachments design, Kellett Aircraft Corp., Upper Darby, Pa., **RICHARD A. BOOKER, JR.**, is now employed as a designer with Marhofer Engine Co., Camden, N. J.

JOHN MARKELL, JR., is now associated with the Aviation Gas Turbine Division of Westinghouse Electric Corp., Lester, Pa., as development engineer.

R. G. MESCHINO, formerly flight lieutenant, research engineer, Royal Canadian Air Forces, has enrolled as a student at University of Michigan, Ann Arbor.

LT.-COL. G. E. LEDBETTER has returned to his pre-war position as New England manager of the Champion Spark Plug Co., Toledo.

E. E. KROGSTAD, since his resignation from the U. S. Navy as a lieutenant commander, has been appointed assistant branch manager of the International Harvester Co. at Tulsa, Okla.



Edward N. Cole

An outstanding product of General Motors Corp. technical training program, **EDWARD N. COLE** has been appointed chief engineer of the Cadillac Motor Car Division of the corporation by **JOHN F. GORDON**, general manager of Cadillac. Starting out on a career of law, Mr. Cole saw a bulletin explaining the then new General Motors Institute. Following graduation from the Institute, he rose from laboratory assistant, to designer, engine engineer, chief design engineer, and then assistant chief engineer late in 1944. He succeeds Mr. Gordon as chief engineer.

Until recently vice-president in charge of manufacturing, Schick, Inc., **C. C. LEWIS** has been appointed plant manager of the Victor Division, Radio Corp. of America, Chicago.

VERNON EDWARD MUSSER is now a designer for Born Engineering Co., Tulsa, Okla. He had been steam power engineer, Ohio Match Co., Wadsworth, Ohio, before joining the Army where he was commissioned a lieutenant in the Corps of Engineers.

Formerly chief engineer of Weidenhoff, Inc., Chicago, **BUTLER J. HASKINS** has opened a consulting engineering service in Osage Beach, Mo. He had been in charge of engineering of the Chicago company for about 22 years before his retirement.

ROBERT HENSLEIGH has organized the Hensleigh Co., in Detroit, a consulting engineering firm. He had been a project engineer for Continental Motors Corp.

Having resigned from the Lombard Iron Works, Augusta, Ga., **J. A. HUTCHINSON, JR.**, has been appointed plant manager of Knox Metal Products, Inc., Waynesboro, Georgia.

A. D. PUCKETT, until recently petroleum engineer with the National Bureau of Standards, Washington, D. C., has joined the U. S. Bureau of Mines, and has been assigned a similar position at the Petroleum Experiment Station, Bartlesville, Okla.

R. C. STOLTE is now engine development engineer, Chevrolet Light Car Division, General Motors Corp., Detroit. He was in charge of Canadian operations, General Motors Corp., Detroit.

Chief engineer of General Motors of Canada, **E. F. ARMSTRONG**, formerly held the position of assistant chief engineer with the same company.

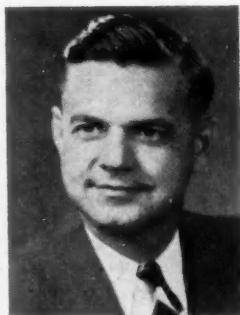
DONALD Y. NICHOLAS, who served as lieutenant (j.g.) in the U. S. Navy, is currently general manager, D. G. Nicholas Co., Scranton, Pa.

ZACHAR ARKUS-DUNTOV, production engineer, Arduin Mechanical Corp., New York, was one of the participants in the Indianapolis 500-mile sweepstakes, May 30. Mr. Arkus-Duntov drove a Talbot, French racing car.

M. P. FERGUSON, president of the Bendix Products Division of Bendix Aviation Corp., announced the appointment of **G. E. STOLL** as general manager. Mr. Stoll has been with the Bendix Aviation Corp. since 1929 and has been assistant general manager of the Products Division since 1943. **C. D. MANHART** has been made sales manager in charge of all aircraft product sales of the



G. E. Stoll



C. D. Manhart

Bendix Products Division, Bendix Aviation Corp., South Bend, Ind. Mr. Manhart was identified with the technical development of Stromberg injection carburetion and allied fuel systems. It is said that he flew the first airplane equipped with this type carburetion. Under the direction of C. V. Johnson, administrative engineer of the Bendix Division at South Bend, **J. R. CAUTLEY** will assume staff responsibilities. He will undertake several important studies in connection with future activities on landing gear and new aircraft devices.



Alfons Alven

ALFONS ALVEN, since 1932 district manager of the Chicago office of Bearings Co. of America, was elected president of the company on June 10, according to an announcement by **J. L. STRAUB**, chairman of the board. He was elected to the board of directors early this year. He succeeds Henry W. Jackson, resigned.

Ultrasonic Corp., Boston, has appointed **GORDON C. SEAVEY** chief mechanical engineer. He had been research engineer with Aircooled Motors, Inc., Syracuse, N. Y.

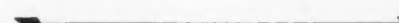
KARL BECKWITH SMITH, JR., has been elected secretary-treasurer of River Bend Motor Corp., AuSable Forks, N. Y. He recently resigned from Eastern Aircraft Division, General Motors Corp., as field service engineer.

Until recently field engineer of Wright Aeronautical Corp. at the Glenn L. Martin factory in Baltimore, **CHARLES H. SWEENEY** has returned to Paterson as sales engineer for the aircraft engine concern.

H. W. TOOMEY has left Rio de Janeiro and has been appointed by his company, Pan American Airways System, as manager of its Latin American Division, Pan American World Airways, with headquarters in Miami, Fla.



HARRY O. MATHEWS (right), who joined the Army early in 1942, is now with Standard Brands, Inc., New York City, as transportation engineer at Berwyn, Ill. He was assigned to the Quartermaster Corps, and later transferred to the Ordnance Department, a lieutenant colonel in charge of maintenance of Army vehicles. His work included modification of tanks and other combat vehicles. Shown here, Mr. Mathews is being awarded the Army's Legion of Merit medal by Brig.-Gen. Rogers. A past vice-president of the Society for Transportation & Maintenance Engineering, Mr. Mathews has been a member of numerous technical and administrative committees of the SAE, and was active in the Chicago Section of which he was elected chairman for the 1939-1940 term. He served two terms as SAE councilor.



FRANK H. ERDMAN recently resigned as an engineer from Wright Aeronautical Corp., Paterson, N. J., to become a design engineer for McDonnell Aircraft Corp., St. Louis.

Since leaving the office of the Chief of Ordnance, Detroit, as a lieutenant, **JOHN FREDERICK SWIFT** has been a transmission engineer at Ford Motor Co., Dearborn, Mich., on the staff of the engineering laboratories.

ROBERT M. HOLLOWELL has joined Republic Supply Co. of Calif. as a designing engineer on oil field machinery. He had been in the Navy as a machinist's mate 2/c.

MAJOR-GEN. G. M. BARNES, who recently resigned as deputy chief of Ordnance and chief of the Ordnance Department's Research and Development Division, has been appointed engineering assistant to **EDWARD G. BUDD**, president, Edward G. Budd Mfg. Co., Philadelphia. General Barnes has been credited by the Army for heading up the development of more than 1600 weapons and Ordnance items of a total of 1900 projects undertaken to defeat Germany and Japan. During the war he frequently called upon SAE technical committees to help solve engineering problems, and was one of the five general officers who signed the Ordnance Distinguished Service Award presented to the Society during the 1944 Annual Meeting.

Production Engineer **H. L. KELLER** has taken a position with the Ohio Crankshaft Co., Cleveland. Mr. Keller had been associated with the Buick Motor Division, General Motors Corp., Melrose Park, Ill.

FRANK M. HAWLEY, for 30 years with the Morse Chain Co., Ithaca, N. Y., and until recently its vice-president and general manager, was appointed president of the Borg-Warner Corp. subsidiary, **C. S. DAVIS**, president, announced. Mr. Davis made public plans for the expenditure of between \$25,000,000 and \$30,000,000 by the corporation to rehabilitate its plants and to acquire new manufacturing machinery worn out during its armament manufacturing program.

Mathews Honored



Among SAE members who participated in the Semi-Annual meeting of the American Society of Mechanical Engineers, June 17-20 in Detroit were SAE Past-President **HARRY T. WOOLSON**, executive engineer, Chrysler Corp., **F. GLEN SHOEMAKER**, Detroit Diesel Engine Division, and **JOHN F. GORDON**, general manager of Cadillac Motor Car Division, General Motors Corp., and **PETER HERGET**, Ford Motor Co. They told of the automotive industry's engineering and production contributions in producing tanks and other combat vehicles for the Army.

WILLIAM H. LEININGER, president of Leininger Industrial Co., Detroit, has organized the Leininger Home Supply Co., Mount Clemens, Mich., to deal in building materials and household appliances.

Upon his resignation as head of the mechanical laboratory, Aircraft Engine Division, Packard Motor Car Co., Toledo, **DON B. WEBSTER** has joined the automotive research department of Ford Motor Co., Dearborn, Mich.

FREDERICK P. BRAGGERMAN, formerly with the Ford Motor Co., truck engineering staff, has been appointed a project engineer for ACF-Brill Motors Co., Philadelphia.

D. C. CORNELL has established a dealership for Kalamazoo stoves and furnaces under his name at Richmond, Ind. He had been a mechanical engineer with the engine laboratory of the National Advisory Committee for Aeronautics, Cleveland.

ROBERT BIRDSALL, formerly ensign, USNR, Department of Marine Engineering, Annapolis, is now employed in the engineering laboratory of the Ford Motor Co., Dearborn, Mich.

DANIEL BROWN has returned to his former position with the Armour Research Foundation, Chicago, after serving in the U. S. Army as technician fifth grade in the Q.M. Petroleum Salvage Detachment.

B. R. (Bob) TERE has been appointed project engineer in charge of aircraft development of the Weatherhead Co., **GEORGE H. HUFFERD**, vice-president in charge of engineering, announced. For 15 years with the Curtiss Airplane Division, Curtiss-Wright Corp., Mr. Tere was chairman of the National Aircraft Standards Subcommittee on Hydraulic and Pneumatic Systems, and is chairman of the SAE Committee A-6, Aircraft Hydraulic Equipment. This brings the Weatherhead SAE membership to 52.

B. R. Tere



Dean M. Gillespie

Representative **DEAN M. GILLESPIE** (Colo.) was appointed by Representative John Taber (N. Y.) to represent the House Appropriations Committee at Operations Crossroads, Bikini Isle in the South Pacific. In his letter of appointment, Congressman Taber expressed his appreciation of Mr. Gillespie's acceptance, pointing out that it was very desirable to obtain "an engineer and a member of the Society of Automotive Engineers" to observe the atom bomb tests on behalf of the Appropriations Committee.

LT.-COL. K. L. STEHLE, formerly with the AAF in Columbus, Ohio, has joined the Standard Oil Development Co., Esso Laboratories, Elizabeth, N. J.

PIERRE STUART DE BEAUMONT, who was released from the Navy as a lieutenant, has joined Apex Electrical Co., Cleveland, as a project engineer.

ARNOLD SCHINDEL has returned to Eclipse Pioneer Division, Bendix Aviation Corp., Teterboro, N. J., following his service with the Army.

LT. B. FURMAN WILKES, USNR, has returned to Shell Development Co., Emeryville, Calif., as a junior research engineer.

Retiring recently as a lieutenant commander in the U. S. Navy Bureau of Ships, Washington, D. C., **ELMER F. GRIEP** is now associated with Standard Oil Co. of Calif., San Francisco.

FRANK A. GUNDLACH has returned to the National Carbon Co., New York City, as technical supervisor following service with the U. S. Army as a lieutenant in the Ordnance Department.

Now assistant to the director, Richmond Laboratories, California Research Corp., San Francisco, **LLOYD H. MULIT** has been in the U. S. Navy serving as a lieutenant commander.

SYLVAN EDWARD CONNAIR, JR. has joined Inland Division, General Motors Corp., Dayton, Ohio. He had been a Navy ensign.

HOWARD PHILIP McJUNKIN has returned to Charleston, W. Va., and is engineer with the McJunkin Supply Co. there. He had been an engineering officer with the rank of lieutenant (i.g.)

WALTER A. KULL has been appointed district sales engineer of C & J Supply Co., Highland Park, Mich., having resigned as sales manager of the Saginaw Steering Gear Division, General Motors Corp.

Taylor Sales Engineering Corp., Elkhart, Ind., has recently appointed **B. W. KNIGHT**, manufacturer's representative of Racine, Wis., as their sales engineering representative in the states of Illinois, Iowa, Minnesota and Wisconsin. Mr. Knight is well known in the farm machinery and industrial fields and his appointment was made by Taylor Sales Engineering Corp. in an effort to render closer contact and a greater degree of service to the many builders of engines now using the Float-O unit manufactured by them.

G. A. WATERS, who started with the Wagner Electric Corp. in 1909, has advanced to the position of vice-president in charge of manufacturing.

Caterpillar Tractor Co. has announced that **N. E. RISK**, who is responsible for supervision of all engineering and coordinated activity pertaining to the application of allied equipment and special attachments, will also assume supervision of transmission design.

MAJOR LEROY B. VOSHALL has joined the Texas Co. as engineering representative. He had been serving in the Army Ordnance Department overseas.

ROBERT HENRY MILBRATH, who served as assistant naval attache on the staff of the American Embassy in Buenos Aires with the rank of lieutenant commander, has joined the West India Oil Co., S.A.P.A., in the capital of Argentina.

DANIEL M. ADAMS, who had served as a first lieutenant in the AAF, is an assistant section engineer for Cadillac Motor Car Division, General Motors Corp., Detroit.

Formerly commander of the U. S. S. Tangier, **CAPT. R. M. OLIVER** is serving as director, Inspection Division, Bureau of Aeronautics, Washington, D. C.

Formerly chief engineer, C. M. Lovsted & Co., Inc., **WILLIAM B. MEREDITH** is now associated with the Continental Trailer & Equipment Co. of Honolulu.

E. T. SYVERTSEN has been named general manager of the Service Division of Thompson Products, Inc., filling a position recently left vacant by the resignation of **T. O. DUGGAN**, it was announced by **F. C. CRAWFORD**, president of the company. Mr. Syvertsen has been with the



E. T. Syvertsen

Cleveland auto and aircraft parts manufacturing concern for twenty-five years, the last ten as sales manager of the division he now heads.



Frederick E. Moskovic (left), industrial consultant, A. O. Smith Corp., has been appointed a special consultant for the Procurement Division, Air Materiel Command, Brig. Gen. Edwin W. Rawlings, chief of the division, announced. Mr. Moskovic is shown here with the general at a recent inspection trip where they aided in the dedication ceremonies of the General Electric Co. flight test laboratory

Elected early this year president of Cobey-Waite, manufacturers of model aircraft engines, **WILLIAM E. COBEY, JR.**, had been powerplant staff engineer of Kellett Aircraft Corp., Upper Darby, Pa.

ROBERT EUGENE KENNEMER, who recently resigned from the U. S. Navy, has joined Caterpillar Tractor Co., Peoria, Ill., as research engineer.

Following his tour of duty with the U. S. Army, **ROBERT STEVENSON, JR.**, has joined the automotive engineering staff of Ford Motor Co., Dearborn, Mich.

HENRY E. HARRIS, who had been with the U. S. Coast Guard Marine Engineers, has organized Harris Engine & Equipment Co., Anacortes, Wash., of which he is owner and marine engineer.

Phillips Petroleum Co., Minneapolis, Minn., has appointed **EDWARD H. WOEHRLE**, formerly a lieutenant (j.g.) stationed at the U. S. N. training school at Hollywood, Fla., lubrication engineer.

ROBERT A. HINTERMISTER, until recently in the U. S. Maritime Service, has been named a production contact engineer by Pratt & Whitney Aircraft, division of United Aircraft Corp., East Hartford, Conn.

Released from the service as a captain in the U. S. Marine Corps, **ROBERT H. ADAMS, JR.**, is now with the Southern Pacific Railroad, Scottsdale, Ariz.

Returning to his post as automotive mechanics instructor, Connelley Vocational High School, Pittsburgh, **M. ROBERT RASPET** has been serving with the U. S. Marine Corps as a maintenance officer.

ALBERT A. SMITH, superintendent of research, American Smelting & Refining Co., Barber, N. J., has been appointed a member of Subcommittee A on Light Alloys of the SAE Non-Ferrous Metals Committee as an official representative of the Aluminum Research Institute.

Now sales engineer with J. T. Jenkins Co., Inc., San Francisco, **GLEN R. GUNDERSON** is distributing Kenworth trucks in California, Nevada, and Arizona. He was previously with Charles W. Carter Co. as service engineer.

L. A. McDONELL, past-chairman of Hawaii Section, has resigned as superintendent of heavy equipment, Honolulu Construction & Draying Co., to become mana-

ger of the Heavy Equipment Division of Territorial Motors, Ltd., Honolulu. Mr. McDonell has recently returned to Hawaii after spending some time in the United States on business.

JOHN ST. HORNOW has been appointed to UNRRA headquarters in Shanghai, assigned to duty with the SNRRA, the Chinese subsidiary organization.

Released from the Navy as a lieutenant (j.g.) **J. P. HUNSAKER** has joined the consulting engineering firm of Jackson and Moreland, Boston. He had been assigned to the U. S. Naval Engineering Experiment Station, Annapolis.

CLARENCE L. WASHBURN has been appointed plant superintendent in charge of manufacturing of Indian Motorcycle Co., Springfield, Mass. He began his engineering career with Westinghouse, later joined Chandler-Evans, Niles-Bement & Pond Division of Pratt & Whitney, and subsequently



Clarence L. Washburn

was factory manager of Torque Mfg. Co., Plainville, Conn. From 1937 to 1940 he was in charge of the mechanical design section, Washington Institute of Technology.

turn to p. 47

OBITUARIES

Edwin H. Ehrman

A member of SAE since 1911 and a pioneer SAE and national screw threads standards expert, Edwin H. Ehrman died in Chicago June 14 at the age of 80. One of the two SAE representatives delegated to the National Screw Thread Commission under provisions of an act of Congress in 1918, Mr. Ehrman also served the Society as chairman of the Miscellaneous Division, and a member of the Aeronautic Division of the SAE Standards Committee until 1921, when the Screw Threads Division was formed. He was chairman of this division at the time of his death.

From 1923 until his death he was a member of the SAE Committee on Methods of Expressing Limits and Tolerances, and for 17 years was one of the SAE representatives on the ASA Sectional Committee on Screw Threads. He was an SAE member of the American Commission at the Inter-Allied Standards Conference in London, England, in 1918.

Upon graduation from the University of Michigan in 1888, he worked for engineering concerns in Chicago for the next seven years, when he formed the firm of Walker & Ehrman, designers and builders of special machinery. This firm was merged with the Chicago Screw Co., and the latter subsequently merged with the Standard Screw Co. At the time of his death he was chief engineer of the company.

Walter A. Hamilton

An infection resulting from an operation caused the death on March 28 of Walter A. Hamilton, 45 years old, special assistant to the executive vice-president, Transcontinental & Western Air, Inc., Kansas City. Among his positions prior to joining TWA he had been vice-president of the Aero Corp. of California, Inc. He was elected to membership in the Society in 1930.

Marshall Headle

A pilot in the Air Corps and later with the U. S. Marine Corps air service during World War I, Marshall Headle, managing director of the Marshall Airframe Co., Moneta, Calif., died recently. A graduate of Massachusetts State College, class of 1913, he became chief test pilot of Lockheed Aircraft Corp. during his 15 years with that company before organizing his own firm in 1944.

Boris Peter Sergay

Development engineer for S & B Machine Co., Wayne, Mich., Boris Peter Sergay died on June 1 at the age of 46. Mr. Sergay obtained his early technical education at the Imperial University of St. Petersburg and later took a degree from the University of Michigan. He had been a design engineer of Reo Motor Co., Lansing, and prior to that had been a research engineer for the Michigan State Highway Commission on automobile traction.

Norman F. Wanger

Internal combustion engineer with Gulf Oil Corp., Philadelphia, Norman F. Wanger died April 10 in his home at Conyngham, Pa., at the age of 47. He had been with Gulf for 11 years.

continued from p. 27

analysis would result in a steel somewhere between the 8600 and 9800 series.

The Subdivision favored including 4817 steel in the SAE group of steels.

Steel Hardness Conversion Numbers

In his report on Subdivision XVI, Chairman T. H. Wickenden, International Nickel

Personnel Changes

A number of personnel changes in Panels and Subdivisions have been announced by Chairman Eddy which take effect immediately and have no connection with the reorganization plans.

Glenn C. Riegel, chief metallurgist, Caterpillar Tractor Co., has been elected Vice-Chairman of the Iron and Steel Executive Committee. He succeeds Mr. Eddy who took over the Chairmanship upon the resignation of former Chairman Frank Gilligan.

Colonel S. B. Ritchie, Office Chief of Ordnance, has been appointed a member of the Executive Committee, succeeding Colonel J. H. Frye, who retired from the Army.

L. L. Ferrall, Crucible Steel Co. of America, succeeds L. E. Ekholm, Climax Molybdenum Co., as Chairman of Panel A, Steel Producers.

H. W. Browall, Inland Steel Co., succeeds J. H. Nead as Chairman of Subdivision VII, 1000 Series SAE Steels.

Appointments to Panels and Subdivisions also include Earl E. Wagner, Hoover Ball & Bearing Co. to membership on Panel J, Bearings, succeeding H. T. Morton; Frank Gilligan to Panel K, General Users; George Breyer, Crucible Steel Co., to Subdivision VII, 1000 Series SAE Steels; L. D. Bonham, Lockheed Aircraft Corp. to Subdivision XV, Stainless Steels.

The following appointments of SAE representatives on ASTM committees succeeding Frank Gilligan were also announced: N. L. Deuble, M. W. Kellogg Co., on ASTM-A-1 Committee; Gosta Vernerholm, Ford Motor Co. to ASTM-A-1, Sub-Committee 8, and E. H. Stilwell, Chrysler Corp. to ASTM-E-1-1.

Co., said that the information on Hardness Tests and Hardness Number Conversions in the 1946 SAE Handbook is substantially the same as that published in the 1945 Handbook, with the following additions or changes:

• A table has been added showing the Brinell hardness numbers for various loadings. This table is based upon a 10 mm. ball and shows Brinell hardness numbers for a range of diameter of indentations for loadings of 500, 1000, 1500, 2000, 2500 and 3000 Kg. The table has been added as a matter of

AERONAUTIC MEETING

and
Aircraft Engineering
Display

October 3-5

Biltmore Hotel, Los Angeles

convenience and quick reference, no attempt being made to show conversion values to other systems.

• In connection with Tables 2A and 2B, an explanatory note has been added to clarify the relationship at high hardness between Brinell, Vickers and Rockwell scales.

No further action has been taken by the joint SAE, ASM, ASTM Committee on Hardness Conversion.

Ponder Power Needs For Two-Way Radio

PRACTICAL two-way radio installations for fleet operation are rapidly approaching realization as individual problems are being studied and solved by the Radio Communication Committee of the SAE Transportation & Maintenance Technical Committee. Presently under discussion by the Committee is the determination of current requirements.

The voltage operating range of the radio sets has been tentatively established at 5.7 to 7.5v. Committee members feel that the sets should be designed to operate between 5.0 and 8.5v for 10 min without damage to the set.

Chairman W. C. Baylis, N. Y. Power & Light Corp., has assigned a subcommittee to prepare a report on current requirements. The report is to include data on batteries and generators for these three types of operation:

1. Very low mileage vehicles which require outside charging periodically,
2. Cruising vehicles that can operate without outside charging, and
3. High mileage, interurban vehicles where practically no problem exists.

Space provisions for the radio sets will continue to be a catch-as-catch-can proposition for some time to come, the Committee believes. Until such time as the number of installations becomes great enough to justify spending additional sums on all vehicles, installation of the set will have to be made in the space that happens to be available.

Student Branch News

Fenn College

The Fenn College SAE Branch held its first annual dinner meeting on June 14. Guests present were: Max B. Robinson, dean of the School of Engineering, Dr. D. C. Fabel, head of the Mechanical Engineering Department and Mr. Stringham of the Lincoln Electric Co. Dr. Fabel recently returned to the college after serving six years with the U. S. Army. He was a lieutenant-colonel at the time of his discharge.

Chairman Sam Close presented a report on the progress of the Fenn Branch for the year, listing such high spots in its program as the aviation meeting in January, the field trip through the NACA Engine Research Laboratories, the electronics meeting in February, and the annual student dinner meeting sponsored by the Cleveland Section of SAE in March at which time Fenn received its Student Charter.

Mr. Stringham, guest speaker for the evening, spoke on "Arc Welding and its Applications." He explained the use of welds of like and unlike metals and their advantages in production. He pointed out that, at present, structures are not designed for welding, but for riveted construction, and it is necessary to adapt these designs to welding.

The election of officers for the next fiscal year was held. The results were as follows: Chairman, Raymond Hitti; Vice-Chairman, Robert Crouse; Secretary, Charles Kercher; and Treasurer, Max Luehrs.

General Motors Institute

The General Motors Institute Student Branch went on the most interesting trip of the entire year through the General Motors Proving Ground at Milford, Michigan.

Two Greyhound busses were required to transport the approximately 70 students to Milford. On reaching the Grounds, a GMC test coach and five cars were used to carry the group for a tour around the various test roads. Some points of interest to the students were the many hills of different uniform grades, the speed track, the "Belgian Block" road. The 30% and 60% grade pavements left the fellows with their eyes bulging.

Following the tour of the grounds, the group split up and went through the sound laboratory and the dynamometer building. Two vehicles were set up on the dynamometer which the students could inspect.

Next, the group assembled in the auditorium for a short talk on the functions of the Proving Ground by the director, H. H. Barnes. Dr. Paul Huber, the assistant director and head of student activities for the SAE Detroit Section, gave a very interesting talk on a new high speed motion picture camera taking an amazing number of frames per second. He showed one film on the operation of the firing mechanism of an M2 carbine and another "scientific" study on how bees and flies take off from a table.

The only fault that could possibly be found with the trip was the usual shortage of available time.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between June 10, 1946, and July 10, 1946.

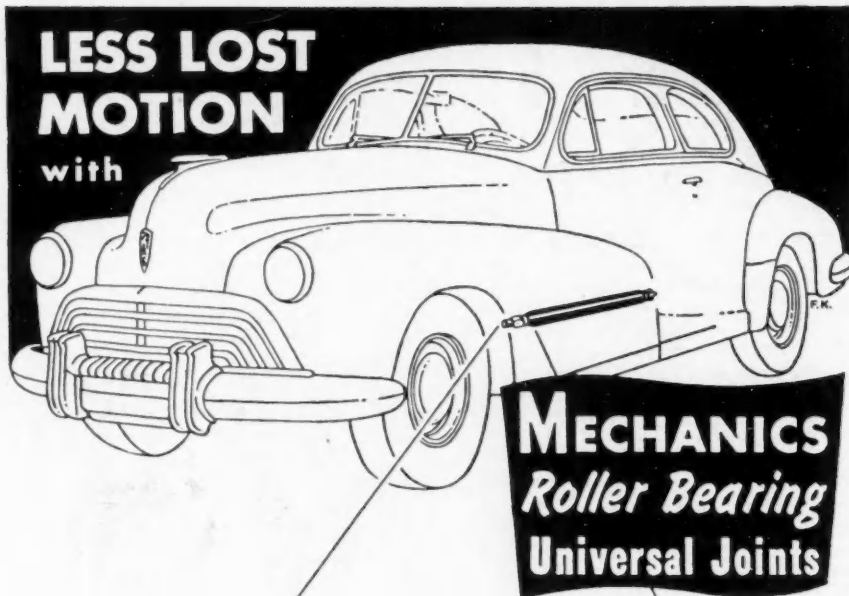
The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Leonard S. Moore (SM), Sam. Seckler (J).

Buffalo Section: Roy R. Fruehauf (J).

Canadian Section: Percy E. Walters (A).

Chicago Section: Otha Leroy Colwell



The slip-on-the-transmission-shaft feature which permits both MECHANICS Roller Bearing UNIVERSAL JOINTS to be welded to the tubular shaft, reduces lost motion, excessive play, whip and runout to a minimum. Let our engineers show you how this and other MECHANICS features will help give your new models competitive advantages.



MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner

2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.

(M), A. H. Kerndt (M), Robert Walter McNabb (J), Norman D. Williams (M), John L. Winge (M).

Cincinnati Section: Gus A. Broetzler (M), Clifford Duhme (A), William L. Suire (M), Walter Walkenhorst, Jr. (A), John Weber (M), Russell Edwin Wolfe (A).

Cleveland Section: Frank Calvin Bayer (J), Robert Paul Bradshaw (A), Alfred J. Chandler (A), Robert T. Duffy (J), L. J. Fageol (M), Leonard C. Fisher (A), Louis F. Held (J), Richard B. Proudfoot (M), Paul H. Richard (J), Richard J. Schager (J), Edwin H. Scott (J), Leonard F. Thunhorst (A), Chieh-Nge Wen (A).

Colorado Group: Charles D. Douglass (A).

Dayton Section: Lloyd F. Engelhardt (M), Fred Schwenk (A).

Detroit Section: Willard G. Beattie (A), Hermann C. Brunn (M), Layton E. Bury (M), William H. Collman (M), Frank Robert Lee Daley, Jr. (J), L. L. Curcun (M), Alfred Frank Debicki (M), Robert Owen Ellerby (J), Mark T. Feeley (M), R. Grey Firth (A), Clare H. Graham (M), J. Stephen Hammer (M), Ralph B. Hayne (M), James F. Hoffer (M), Norman A. Holly (M), Gerald W. Hostetler (M), Eugene V. Ivanso (M), Robert K. Jack, Jr. (M), Lloyd E. Kamm (J), Russell E. Kaufman (M), Stephen Kershaw (M), John L. King (A), W. L. Klingman (M), Robert W. Kos (J), J. Robert Lakin (A), Edwin Robert Langtry (A), Dean E. Leffler (M), Lawrence R. Lentz (M), George H. Link (A), Alan G. Loofburrow (M), John D. Lorimer (J), Johan Lund (M), Robert H. Madison (J), Hans A. Matthias (M), Herbert F. McClure (A), Leonard C. Meyer (A), Byron Montgomery (M), William Mussnig (M), Edward B. Northup (M), G. L. Ogdin, Jr. (A), Robert H. Pinney (J), George S. Raeder (M), Harry M. Ramsay (A), James Rayer (A), Howard A. Reed (M), James W. Schiefer (J), Harold Schmidt (A), James W. Shank (J), Burton E. Tiffany (M), Edward A. Wheeler (M), Harold C. Williams (A), James B. Williams (J).

Hawaii Section: Louis M. Eihl (A).

Indiana Section: Jesse L. Click (A), James Kirk Gregg (J).

Metropolitan Section: Dudley C. Adamson (M), J. V. Bassett (M), Roland Christian Bergh (M), Thomas F. Cannan (A), Bernard N. Charles (J), Leo F. Donnelly (J), Seymour Epstein (J), Irwin Fein (J), Irvin W. Folk (A), Lt. Jack S. Gilhart (A), Bernard W. Goldberg (J), Douglas Keator Griffin (J), J. S. Hall (M), James T. Harker (J), George M. Kohler, Jr. (J), Alan A. Kurtis (J), Paul Wilson Leak (J), Herbert Mandelbaum (M), Francis M. McAvoy (J), Edward Dewitt Meeker (A), Henry Muller (M), Frank A. O'Connell (J), Joseph Rafton (A), George Albert Roberts (M), Edward Joseph Sand (J), Bernard Schaffer (M), Charles Robert Schreiber, Jr. (J), Lt. (jg) Edward Stephen Shahin (J), Willem Jan Baron van Heeckeren (M), A. Bennett Wilson, Jr. (J).

Mid-Continent Section: Delton R. Frey (M), William A. Jones (M).

Milwaukee Section: Trevor Davidson (M), Clifford O. Schaeffer (J).

Mohawk-Hudson Group: George R. Fusner (I).

New England Section: John Hinchman (I), Richard H. Lodge (A), Whitman J. Severinghaus (I).

Northern California Section: Wilbur Herbert Ball (M), George J. Harris (A), Al Menzmer (A), Paul Clifford Perry (M), William Eugene Shafer (A), Robert G. Truluck (A), Hans Warkentin (M).

Northwest Section: Joseph C. Cassidy (A), Dan P. Cheney (A), Evert C. Nensen (A).

Philadelphia Section: James H. M. Boas (I), Bruce M. Dunham (SM), James Francis Hoey, Jr. (I), Francis G. Huyler (A), Dale Ernest Kistler (I).

Pittsburgh Section: Lawrence C. Armstrong (I).

St. Louis Section: Frederic L. Matthews (M), Howard M. Parkes (M).

Salt Lake Group: William Bernard Littreal (M).

Southern California Section: Arthur G. Anderson (I), Harvey C. Biggs, Jr. (I), Walton T. Boyer (M), Lloyd Graham Curtis (I), Vaughan W. De Kirby (M), Bert Folda (M), Orville W. Freeman (M), Edward Allen Griswold (M), William Ellis Kavasch (I), Eston A. Laughlin (A), Robert V. Lindberg (A), John O. Longenecker (M), Gordon Moore (A), Almontie C. Smith (M), LeRoy Mayhew Smith (M), Bruce Orville Todd (I), Harrison L. Trenslove (I), Edward E. Tuttle (M).

Southern New England Section: Charles H. Nute (I), Bennett S. Savin, Jr. (I), Seth Haines Stoner (M).

Spokane Group: Donald Ernest Majer (I), Harley James Papineau (A), Roy Neal Williams (I).

Syracuse Section: Philip R. McGinnis (I).

Texas Section: Duncan Trapp (A).

Twin City Section: Martin B. Cahill (M), Waldo H. Kliever (M).

Washington Section: Ferdinand G. Brickwedde (SM), John King (A), Norman L. Klein (SM), Axel B. Niskanen (A), Lt. Col. George W. Rogers (SM).

Western Michigan Section: Miss Lily Gertrude Short (A).

Wichita Section: George E. Harris (I), Clyde V. Lassmann (I).

Williamsport Group: Watson F. Boyer (I), Ernest S. Burrows (M), Byron Lawrence Carpenter (I), Carl C. Spangenberg (M).

Outside of Section Territory: Jose Miguel Cruz Tous (I), Frank A. Hall (A), Howard A. Kirsch (I), William E. Knapp (M), Capt. Frank R. Koplin (A), Charles M. Kuhlback (I), Paul F. McMahan (SM), Walter E. Schirmer (M), Howard Edward Somes, Jr. (I).

Foreign: Alfredo F. Bottaro-Lopez (A), South America; George Bernard Jones (FM), England; Michael J. Meier (M), Philippine Islands; John Campbell MacKechie Sanders (FM), England.

APPLICATIONS Received

The applications for membership received between June 10, 1946, and July 10, 1946, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section: Glenn O. Biser, Raymond M. Leighton.

Abernethy, Ed A. Collins, John Edward Howitt, Ralph A. Lees, Allan Alexander Wood.

British Columbia Group: Emerson

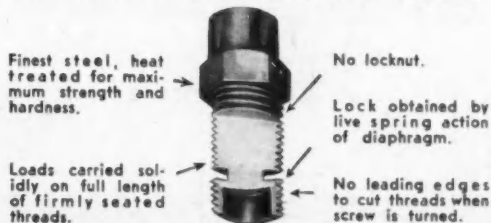
Johnson "LOCK-TYTE" ADJUSTABLE TAPPETS

WITH THE JOHNSON
SELF-LOCKING SCREW

Designed and produced — for all types of internal combustion engines — by "Tappet Specialists," skilled engineers and production craftsmen who have devoted years to the manufacture of the finest tappets made.

Johnson "Lock Tye" Adjustable Tappets stay put and wear evenly — resulting in longer tappet life — greater valve protection — reduction of false motion — and less frequent engine overhauls.

JOHNSON SELF LOCKING SCREW



WRITE FOR
FOLDER 464

Johnson Products, Inc.
TAPPETS ARE OUR BUSINESS
Muskegon, Michigan

Buffalo Section: Michael B. Brett, Jagannath Punnulal Chawla.

Canadian Section: Harold J. A. Chambers.

Chicago Section: Caesar Benassi, Frank F. Davis, Charles E. Cooney, Jr., Albert S. Kiefer, Ira Maxon.

Cleveland Section: Lloyd L. Baldwin, John J. Gapstur, Jr., Robert E. Schwary, Robert M. Ward.

Dayton Section: B. B. Brombaugh.

Detroit Section: Lieut. Frederick C.

Adams, Carl Bailys, Clarence G. Chambers, Sam Hanna, Peter Hay, Cornell Janeway, Philip O. Johnson, Robert J. O'Brien.

Hawaii Section: John Sheehan.

Indiana Section: Eleanore A. Cammack, Leonard O. Edwards, Ermil W. McMurry.

Metropolitan Section: Halvdan Aase, Bruce S. Bailey, Philip Albo, Charles Luther Best, Fred O. Black, Jr., Donald Bradway Clark, Robert Milton Cokinda, Thomas John Dooling, Edward Falenstrom, Peter O. Farrell, Jacob Wyckoff Fenton,

Paul Jay Garber, Anthony Joseph Giotta, Vincent A. Gill, Alexander Goldenberg, Philip S. Hier, Chester W. Hoffman, Frederick Lawrence Horn, George Vincent Judge, Jr., Albert Krinsky, Fred P. Leonard, Elvin A. Mastriani, James David Mooney, Jr., James J. Perkins, Jr., Frederic H. Pollard, Earle J. Raut, Abe Ritterman, Mannie Schneider, Ralph H. Shepard, William E. Simpson, Walter B. Spelman, Jr., Arnold A. Staub, Edwin A. Tervo, Ralph von Ahlefeldt, Frank H. Whaley, Jr., Eugene R. Zeidler.

Mid-Continent Section: Martin Edward Nash.

Milwaukee Section: Ralph George Klieforth.

Mohawk-Hudson Group: William Bronk Shepherd.

New England Section: John W. Hess, John W. McGoey.

Northwest Section: Sherman B. Howard, Richard U. Skarshaug.

Northern California Section: C. O. Gerlach, James J. McKinney, Allen Earl Ridgley, John H. Ritter, John R. Spreiter, Jack R. Stitt.

Oregon Section: George U. Benz, W. P. Currens, Ray Mobley.

Philadelphia Section: Gladeon Marcus Barnes, Gilbert E. Castree, Glenwoode P. Hacker, Sr., Raphael Teitlebaum.

St. Louis Section: Richard Chrzanowski, Paris W. Phipps.

Southern California Section: Duane Lee Bennett, T. N. Baker, Vernon W. Balzer, Allen L. Bristow, Sydney B. Cook, Wilford Coultas, H. Robert Chapman, Lloyd F. Coates, Vere A. Croyle, Victor J. Del Coma, Burtis E. Dorris, Robert M. Francis, Paul H. Goodwin, Arthur J. Granville, William L. Kent, Edward Thomas McKain, Stephen Plummer, Paul Sundberg, Donald C. Webster.

Southern New England Section: Serge E. Gluhareff.

Syracuse Section: Richard D. Williams.

Virginia Group: C. Delaney Walthall.

Washington Section: Howard C. Adams, Leo Morse Chatter, Franklin Bell Reybold, Lloyd Ruther Worden.

Western Michigan Section: Kenneth C. Atkin.

Williamsport Group: G. Frederick Dietz, Jr., Claude Edwin Leibensberger, Jr.

Outside of Section Territory: Lozell L. Hyler, C. G. Lord, Leon L. O'Dell, Robert B. Rice, John J. Tyne, Everett M. Sandahl, Raymond Christopher Williams.

Foreign: Jean Alger, France; Dr. Frei Jaroslav, Czechoslovakia; William M. McComb, India; Paul Redon, France; Albert Shaw, England; John Noel Hutton Tait, England; Alfred Towle, England.

Below: **HYSTER** "150" Lift Truck — Blood Brothers Equipped



BLOOD BROTHERS UNIVERSAL JOINTS HANDLE THE TOUGHER JOBS

Blood Brothers needle bearing universal joints are designed for a wide variety of applications in the automotive field. Write for complete specifications.



About SAE MEMBERS

cont. from p. 42

Formerly automotive maintenance officer, U. S. Navy, Domestic Transportation Office, Navy Yard, Charleston, S. C., LT. (jg) JAMES R. ALPHIN, USNR, is now attached to the District Automotive Transportation Division, Fifth Naval District, as district automotive maintenance supervisor.

COM. S. J. PATRONI, USNR, has been transferred from the Naval Air Station at Norfolk, Va., to the Assembly and Repair Section, Sand Point Naval Air Station, Seattle, Wash.

W. L. CLOSE, Wright Aeronautical Corp., who had been service engineer is now assistant to the airline contact section supervisor.

GIFFORD A. COOK has recently joined the Blackhawk Mfg. Co., Milwaukee, Wis., as representative of the Original Equipment Division. The organization specializes in the manufacture and sale of high pressure hydraulic equipment and wrenches.

T. C. NING has recently joined Glenn L. Martin Co., Baltimore, Md. He was formerly transport engineer with the transport sales department of Fairchild Aircraft & Engine Co., Hagerstown, Md.

LT. (jg) JAMES M. ROBINSON, USNR, has been released to inactive duty after serving 23 months in the Navy, participating in the invasion of Lingayen, Mindanao, Borneo, and the occupation of Japan. Associated with Curtiss-Wright Corp. before joining the Navy, Lieutenant Robinson plans to join the Spence Rigolo Corp.

Formerly electrical engineer with Willys-Overland Motors, Inc., Toledo, Ohio, FRED STROMATT is now chief electrical engineer with Kaiser-Frazer Corp.

Until recently chief engineer of the Kawneer Co., Niles, Mich., K. E. KNOTT is now an engineer with the Zenite Metal Corp., Indianapolis, Ind.

MORTON E. WELDY has become supervisor of road test with Buick Motor Division, General Motors Corp., Flint, Mich. He was previously superintendent of research, Engine Test Division of the same company.

Formerly a student member at C.I.T., Pasadena, Calif., JOHN F. WHITMORE is now laboratory research analyst with Lockheed Aircraft Corp., Burbank, Calif.

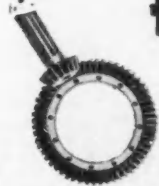
HAROLD M. HART, who had been associated with Industrial Specialties Co., Detroit, is now quality manager with C. A. Norgren Co., Denver, Colo.

THEODORE W. NELSON has become manager of the Aviation Division of Berner-Pease Co., Miami, Fla., a wholesale supply business. He was formerly general manager of the Enrico Air Supply Division of the Embry-Riddle Co., same city.

SAMUEL NOOGER is now serving with the U. S. Navy, Office of Research and Inventions, as assistant chief engineer of the



Fundamental...
to good gear cutting



TOUGH STEELS, deep cuts, high finish requirements characterize most gear cutting operations.

Tearing, scuffing and metal pickup are often serious machining problems to makers of gears.

Wise gear manufacturers avoid these difficulties by specifying Stuart's high lubricity, high anti-weld type cutting oils for gear hobbing, shaping, generating, or finishing operations.

Stuart Cutting Oils and Stuart Engineering Service will help you produce better gears at lower cost.

Write for:

"Cutting Fluids for Better Machining"



D.A. Stuart Oil co.
EST. 1865 LIMITED
2727-51 SOUTH TROY ST., CHICAGO 23, ILL.



Stuart Oil Engineering Goes With Every Barrel

bombing and torpedo section, Engineering Branch, New York City. Formerly he was secretary and chief engineer with Aero Manuscripts, Inc., same city.

JOHN L. SENIOR, JR., has been elected vice-president and treasurer of Luttrell & Senior, Inc., New York City, air transport engineering and management consultants. Mr. Senior was formerly project engineer with Northeast Airlines, Inc., East Boston, Mass.

GORDON W. McKINNEY has been named assistant manager of the installation

department, Curtiss-Wright Corp. Propeller Division, Caldwell, N. J., to serve under **HAROLD H. WARDEN**, installations manager. He joined the company in 1942 and for the past two years has supervised commercial installations. He is an Alabama Polytechnical Institute graduate.

JOSEPH E. MULHEIM, until recently a mechanical design engineer with Westinghouse Mfg. Co., has joined Battelle Memorial Institute, Columbus, where he will do production research studies. He is a graduate of the University of Michigan.

Mechanized Arms

cont. from p. 24

water, and the "Flails," used to clear tracks through vast mine fields.

If we must face the possibility of a third world conflict, General Grant concluded, we must also face the certainty that weapons of a power and scope beyond imagination will be employed—in which case civilization can hardly survive.

User Utility Urged In Materials Specs

Digest of paper

by **J. L. McCLOUD**

Ford Motor Co.

■ Annual Meeting, Jan. 7

(Paper entitled "Methods of Specifying Materials")

USEFULNESS being the only reason for the existence of a specification, Mr. McCloud advocates coordination between the two phases of the specification problem—writing and application. The materials engineer should prepare or choose a specification that is practical and understandable to all who are to use it, namely: the purchasing agent, the manufacturer, the receiving inspection, and through to the ultimate end that the design conceived with the materials engineer is produced.

Designers require the assistance of well informed materials engineers, although dependence on materials engineers varies according to the character of the design. In the airplane industry it is necessary to utilize the maximum weight-strength ratio. This naturally means that a stress analyst working with both the designer and the materials engineer guides the choice of materials, as the weight-strength ratio limits material availability.

In automobile and truck design with its highly competitive field, cost is paramount. Cost can be increased only if improvement in performance, reliability, luxury, or economy of production results. But with military aircraft, all questions of cost were subordinated to the essential requirement that the functioning of equipment be guaranteed beyond, if possible, the shadow of a doubt. Silver was used for bearings, iridium in contacts, regardless of price.

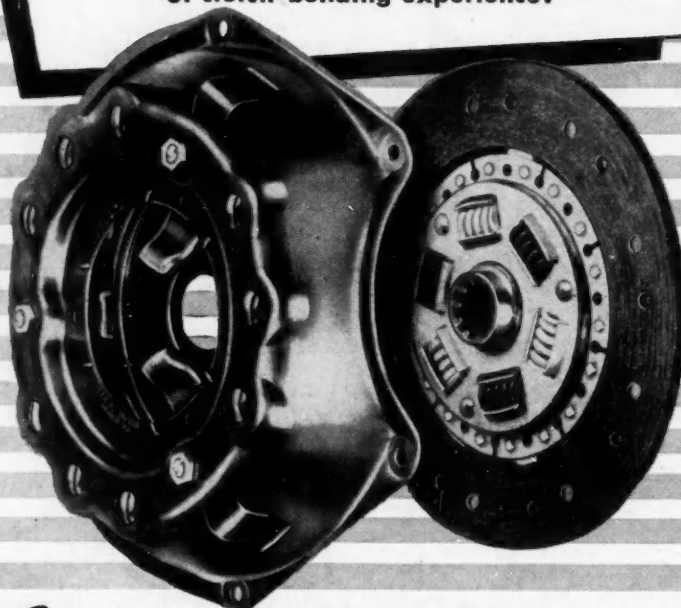
Be clear and specific, Mr. McCloud advises the specification writer. If, for example, material for a steel gear is to be specified, do not say chrome-moly steel or steel forging. Indicate SAE 4620, if that is the material you, the materials engineer, have in mind. Protect the production department from indefinite notes that only you, and perhaps the designer, understand.

Before sitting down to write a specification, the materials engineer should explore all possible sources for existing specifications. Extensive coverage of materials for purchasing purposes can be found in SAE Aeronautical Material Specifications and ASTM Standards. Other SAE specifications cover codes and classifications of materials.

Next best source, from the standpoint of most general use, are manufacturer specifica-

Engineered by Borg & Beck

means . . . backed by forty-one years
of clutch-building experience!



You can depend on—

BORG & BECK

For that vital spot where Power takes hold of the load!

BORG & BECK DIVISION
BORG-WARNER CORPORATION
CHICAGO, ILLINOIS



tions and standards. These are published, in many cases, for the guidance of engineers in specifying materials either not covered by society specifications, or because a manufacturer wishes to differ from society specifications. Still other sources are Federal and Army and Navy lists.

If you must write your own specification, Mr. McCloud concludes, consult all of the above especially manufacturer's data. Consult with prospective manufacturers, for it is desirable to broaden the scope of your purchasing agent to be most economical and to exclude all undesirable material.

Analysis Proves Jet Future Plane Engine

Digest of papers

by MAJOR GEN. B. CHIDLAW
Army Air Forces

■ Detroit, Dec. 10

(Paper entitled "Past, Present, and Future of Jet Propulsion")

and H. J. CLYMAN
Baldwin Locomotive Works

■ Philadelphia, Dec. 12

(Paper entitled "Jet Propulsion and Gas Turbines in Aviation")

FORECASTING the jet as the aircraft powerplant of the future where speed is required, General Chidlaw and Mr. Clyman point out that an examination of jet performance characteristics and a comparison with the conventional engine is necessary to obtain a clue as to trends.

It is agreed that one of the primary advantages of air travel is speed. Speed is essential to the military in that it increases the effective rate at which we can strike the enemy and reduces his time to apply counter measures. From a commercial viewpoint, the airline customer spends a minimum of time en route between places of business. It also means that the operator obtains more scheduled trips out of a given piece of equipment, with the result that his investment is smaller for a given amount of business.

Jet propulsion engines in various forms can achieve the higher speeds desired. But employing jet propulsion for these speeds entails sacrificing some range and some endurance, the amount of each depending upon desired payloads.

The logical question, then, would be:

Why use the jet engine instead of the reciprocating engine for these high speeds? Mr. Clyman demonstrates the advantage of the jet over the "up-and-down" engine by starting with basic concepts and comparing the performance of each.

Performance of a jet engine is measured in pounds of thrust that it produces and is obtained by multiplying the mass flow of air, W/g , and the difference between the velocity of the air at the inlet and the exhaust, $v_2 - v_1$. Thus, $F = W/g(v_2 - v_1)$. In flight, at a given altitude, the mass flow of air forced through the engine is slightly increased with an increase in flight velocity. The difference between jet and flight velocity

decreases with an increase in flight velocity so that the product of these two variables results in fairly constant thrust at most flight speeds.

To compare a jet engine with a conventional one, the relationship between performance expressed in pounds of thrust and brake horsepower must be established. It is expressed by:

$$\text{Equivalent bhp} = \frac{\text{thrust} \times \text{aircraft velocity}}{375 \times \text{propeller efficiency}}$$

This relationship reveals that at 300 mph forward speed, 1 lb of thrust equals 1 bhp if the propeller efficiency is 80%. At 600 mph, 1 lb of thrust is equal to 2 bhp,

if the propeller efficiency remains the same, 80%. But at that speed compressibility reduces propeller efficiency to about 53%, so that 1 lb of thrust is equal to 3 bhp.

A fighter plane of the Spitfire type, with a 1000 hp piston engine and a sea level speed of 300 mph would require a 1000 lb thrust jet engine, according to the above computations. At 300 mph, fuel consumption for the jet would be 1.2 lb per hr per lb of thrust as compared to .51 lb per hr per lb of thrust for the piston engine.

Considering a sea level speed of 600 mph, 8000 hp will be needed since the power required varies directly as the cube of the

VIBRATION can Never Loosen PALNUT

Double Locking Action



The PALNUT is a single thread, spring tempered steel locknut. When tightened, its arched slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt thread and downward on the regular nut (A-A), securely locking both.

Absolute Security — Speedy Assembly — Low Cost

With a regular nut carrying the load and a Double-locking Palnut to keep it tight—you have a powerful fastening team that is unaffected by vibration, heat or oil. You've got a speedy team, too, because both the regular nut and Palnut spin on the bolt freely and install quickly with power tools.

Double-locking Palnuts are extremely low in cost, may be re-used and are interchangeable with other locking

devices. Palnuts are being used with great success on a variety of chassis and engine applications by most leading car and truck manufacturers.

Place Palnuts on test. Send details of your assembly for samples. Detailed literature sent on request.

THE PALNUT COMPANY

70 Cordier St., Irvington 11, New Jersey

Detroit Sales Office:

5-210 General Motors Bldg., Detroit 2, Mich.

DOUBLE-LOCKING PALNUTS

speed. But since propeller efficiency is reduced from 80% to 53% at this speed, it is more probable that a 12,000 hp engine weighing roughly 12 times as much as the 1000 hp engine would be needed. On the other hand, the thrust required to double the speed of the airplane is only four times as great and the jet engine will weigh only four times the weight of the 1000 lb thrust jet engine as jet engines tend to have a constant weight per unit thrust.

Comparing fuel consumption of these two engines indicates a value of 1.5 lb of fuel per hr per lb of thrust for the 12,000 hp engine, whereas the jet engine fuel rate

should be 1.4 lb of fuel per hr per lb of thrust.

The tremendous advantage of the jet engine lies in size and weight, as fuel consumption is about the same for both. In fact, the 12,000 hp. engine would weigh 20,000 lb installed and would be much too large for the Spitfire. The jet engine would not weigh more than 2000 lb and could probably be accommodated in an airplane the size of the Spitfire. General Chidlaw further corroborates this in revealing that the P-80, or "Shooting Star," would require a 6000 hp reciprocating engine to propel it at the maximum speed available with the

jet powerplant.

Although the jet will excel in maximum speed, altitude ceiling, and best cruising speed, the conventional airplane will prove superior in length of take-off run, maximum rate of climb, and range. It can be concluded that the jet engine is going to be used for high-speed military fighter interceptor airplanes for some time to come, unless speed becomes attractive enough to airline operators to sacrifice some economy of slower speed, lower power equipment.

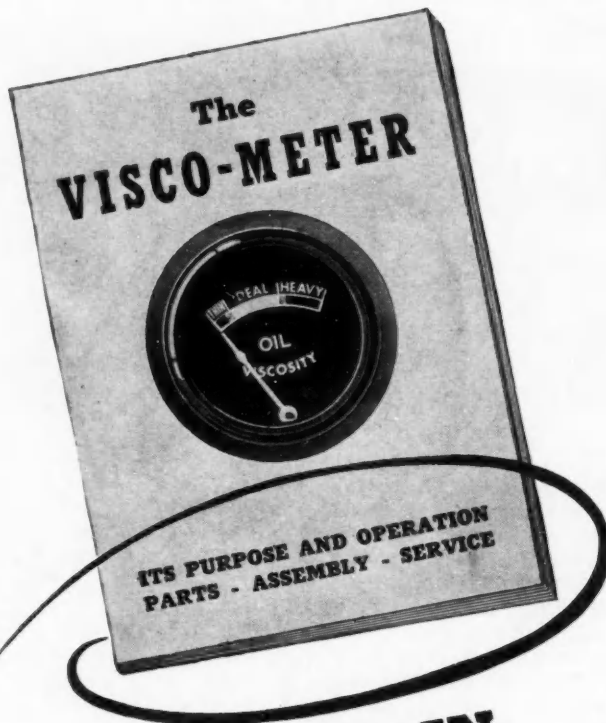
The second type of jet engine, the gas turbine propeller drive engine, is basically a jet engine with suitable gearing and a propeller. The propeller drive gas turbine is longer as more stages are used in the compressor for a high pressure ratio and greater efficiency. The diameter of a geared gas turbine will be less than half that of an "up-and-down" engine of comparable power. This enables the airplane designer to better conceal this type of engine in a wing, and the gas turbine will present a small frontal area.

To compare a reciprocating engine with a gas turbine propeller drive engine, it is necessary to make the comparison on the basis of completed airplanes designed to best fit the characteristics of their particular power plants.

Until now, speeds lower than that of sound have been discussed. As to the possibility of man-carrying machines attaining speeds greater than 760 mph at sea level or 665 mph above 35,000 ft elevation, the speed of sound, Gen. Chidlaw reports that research in this area is just at its inception. The actual drag coefficient of a wing in free flight at the speed of sound has yet to be determined. It is known that engines of much greater power per lb of weight must be developed before supersonic flight comes within the realm of human achievement.

The reciprocating engine will undoubtedly continue to hold its present position in the field of low power and low speed planes, both General Chidlaw and Mr. Clyman agree. However, the gas turbine will come into its own as a jet engine and as a propeller drive for high powered, high speed airplanes.

The turbine-propeller drive is superior to the reciprocating engine in all speed ranges, and to the jet engine in low and intermediate speeds. It is predicted that the gas turbine propeller drive engine will be the first type of gas turbine to be used in commercial flights. In less than 10 years the development of this type of engine will be sufficient to enable its use in all but the low powered planes.



ILLUSTRATED IN EVERY DETAIL

In a gasoline or Diesel engine, nothing contributes so much to high operating efficiency and long service life as constantly correct lubrication. Can you think of anything then, in engine operation, that should be watched or checked more carefully than the oil in the crank case?

For nearly 18 years the VISCO-METER* has been doing an outstanding job on automotive, stationary and marine engines by reason of its "watching and warning" the operator as to the lubricating quality of the oil in the crank case constantly while the engine is in operation. Only VISCO-METER* can perform this engine protection service.

Everyone concerned in the design, manufacture, sale or use of gasoline and Diesel engines should know about the VISCO-METER* in every detail. This completely illustrated booklet makes interesting reading. Write, wire or phone for your copy. There is no obligation.

VISCO-METER

CORPORATION

BUFFALO 7, N. Y.

*Fully covered by U. S. and Foreign Patents

Finds Driving Pleasure In Ideal Transmission

Digest of Paper

by W. S. JAMES

Ford Motor Co.

■ Annual Meeting, Jan 9

(Paper entitled "An 'Ideal' Transmission")

AN ideal transmission would permit the operator to obtain at will, with natural easy movements and the minimum of effort, the desired acceleration, the desired hill abil-

ity, maximum speed of the vehicle, and the optimum fuel economy.

To develop criteria and operational requirements for such a "dream" transmission, Mr. James selects a hypothetical car and engine with assumed basic data. The road weight of the car is taken at 2500 lb, tire rolling resistance as 15 lb per 100 lb of car weight, a frontal area of 30 sq ft, and a .002 drag coefficient.

Graphical performance analysis is made of the car's hill ability, acceleration, and maximum speed in the four transmission ratios and on the grades usually encountered. These charts indicate that the car should perform quite satisfactorily on a 40% slope when in low gear and, if a speed of about 15 mph could be reached, a 50% slope might be climbed. To obtain maximum acceleration, the shift from low to second gear should be made between 30 and 35 mph, or at an engine speed of from 4000 to 4500 rpm.

In second gear, the car should handle very well on a 20% grade and might negotiate short 30% grades at about 25 mph. Top speed of 55 mph might be maintained on a 10% grade. Mr. James feels that the shift from second to direct should be made between 50 and 55 mph for maximum acceleration through the gears.

A maximum speed of about 75 mph should be attainable on the level road in direct drive. Top speed on a 10% grade would be about the same as in second gear, 45 mph.

Having examined the performance of a car with an ordinary 4-speed transmission, Mr. James goes on with his imaginary performance picture and visualizes the operation of an infinitely variable transmission installed in his hypothetical car. Using a 2:1 rear axle, the transmission would be endowed with an infinitely variable range from 1:1 to 6:1; and similarly with a 4:1 rear axle, a range of 3:1 as a reduction and an overdrive range down to 1:2.

To obtain maximum acceleration and maximum speed, full throttle and maximum gear ratio should be used until the engine speed reaches that corresponding to maximum horsepower. The gear ratio should then be reduced as the car speed increases so that the engine speed remains at that corresponding to maximum horsepower. The type of control to obtain this result might be the fully depressed accelerator. A governor on the engine could be used to change the "total ratio" in such a manner that the engine speed would remain at that necessary to develop maximum horsepower.

Provision for Maximum Performance

Arranging the foot acceleration to have three successive stages of travel, it is further suggested, will make available maximum acceleration, hill ability, and top speed. During the first phase of travel, the throttle would be opened up to 80% output; during the second part, the "total ratio" would be increased as the accelerator was depressed, decreased as it was released, and during the third part, the throttle would be opened from the 80% output position to the full throttle position.

In actual operation, the transmission might function as follows: with the car stationary, and the engine idling, the clutch is engaged automatically as the throttle is opened by the depression of the accelerator pedal. The "total ratio" would start at the lowest value; but as the starting

load would probably be too great for this "total ratio," the engine speed would be slowed down below the predetermined minimum speed - 400 rpm.

The minimum engine speed governor would, therefore, increase the "total ratio" until the car started to move and a minimum speed of 400 rpm could be maintained. This might be at about 10:1 "total ratio" or more and a throttle opening giving 80% of wide open throttle torque. As the car speed increased, if the foot accelerator were released slightly, the "total ratio" would be reduced and the speed would continue to increase, but with less and less acceleration.

Should the driver wish to increase the car speed as rapidly as possible, he would step down on the accelerator. This would then change the "total ratio" to the maximum value and open the throttle to the wide open position. The speed governor would then limit the maximum speed to that of maximum horsepower. As the car speed increased, the "total ratio" would decrease and the car would attain its maximum speed corresponding to the maximum horsepower output of the engine and the grade to be negotiated.

In addition to those mentioned above, there are other desirable characteristics for



Photo courtesy Mack Trucks, Inc.

Engineered Efficiency and Economy

FOR MOTORIZED EQUIPMENT OF ALL TYPES ON LAND AND SEA and IN THE AIR

Hallett Filtered Ignition Shielding is the modern way of maintaining an unfailing power supply with full engine power, higher operating efficiency with minimum operating and maintenance costs, and longer life for the entire power unit with minimum time out for overhauls and repairs, for all types of motorized craft on land and sea and in the air. It also assures fast, clear, undistorted and uninterrupted two-way communications via radio and radio-telephone under all conditions by protecting these instruments against outside disturbances. Operators of single units and fleets of land, sea and air craft will find Hallett engineered shielding an important factor in modern, efficient, and economical transportation, and are invited to write for detailed information.

HALLETT MANUFACTURING COMPANY

New York Detroit INGLEWOOD, CALIFORNIA, U. S. A. San Francisco Glendale

HALLETT Cable Address: HALMFG. Established 1916 Code: Bentley's.

Filtered Ignition Shielding

FOR EVERY TYPE OF TRANSPORT ENGINE

the "ideal" transmission, such as:

1. A neutral and reverse gear control to permit manual selection of neutral, forward, and reverse;
2. A manual override on the foot accelerator control for descending hills;
3. To insure safe driving on icy roads and with low wheel torque, the engine speed and "total ratio" should be low;
4. When climbing slippery grades, the engine speed should be low, but as the grade increases a steady torque should be applied to the wheels at a slow car speed, and

5. When wheels lock during a brake stop on slippery roads, the clutch should be disengaged or the drive line disconnected in some manner.

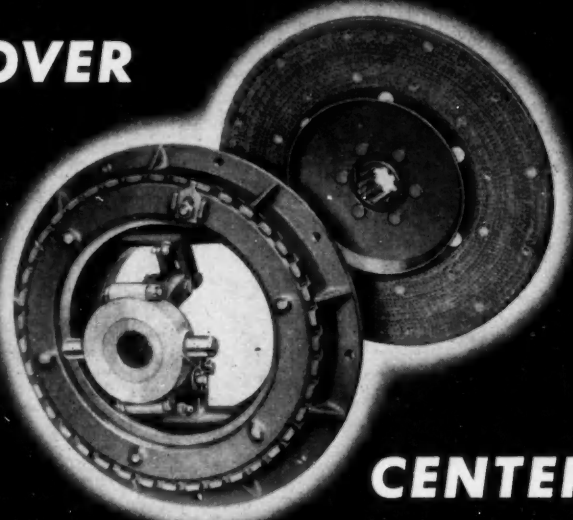
Such a transmission would be quite attractive to the driver. He would have available to him the greatest acceleration, hill ability, and top speed the engine could produce. Then, too, it would be more pleasant to drive a car with such a transmission because of the reduction in engine speed with an accompanying reduction in noise and vibration. The car would be easier to drive because the manipulation of a single control, the foot accelerator, would give complete control of

speed under all conditions of driving, except when braking is required.

Another advantage is the smooth shift from one gear to another made possible by the infinitely variable change of transmission ratios, which could be made at any throttle opening. A longer engine life would be expected because of the limit placed on the maximum engine speed. Finally, the fuel consumption of a car fitted with this transmission should be much less than with the conventional 3- or 4-speed transmission.

But this "ideal" transmission is not ideal in all respects. Mr. James admits there are two principal disadvantages that mar the picture, namely, greater cost and greater weight. One of the chief offsetting factors to the increased cost is the reduction in fuel consumption. He concludes that unless the cost of engine repair is very high, the only justification for the additional cost of his "ideal" transmission is increased operational ease.

ROCKFORD OVER



CENTER CLUTCHES

EASY OPERATION

HIGH TORQUE

POSITIVE ENGAGEMENT

LARGE DRIVING AREA

SMOOTH RUNNING

INFREQUENT ADJUSTMENT

MINIMUM INERTIA

* The ROCKFORD Over-Center CLUTCH has a spring steel adjusting ring plate which yields slightly as the roller cams go over center thus relieving the back plate of strains. A spring-loaded effect holds the clutch firmly in engagement and distributes pressure evenly. Its hard surface and freedom to float * practically eliminate wear. The adjusting ring is threaded for accurate, easy adjustment.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.



ROCKFORD CLUTCH DIVISION

316 Catherine Street, Rockford, Illinois, U.S.A.

BORG-WARNER

Statistics Promise Personal Flying Boom

Excerpts from paper

by W. V. HANLEY

Standard Oil Co. of Calif.

■ Hawaii, June 17

(Paper entitled "Future Prospects for Personal Plane Flying")

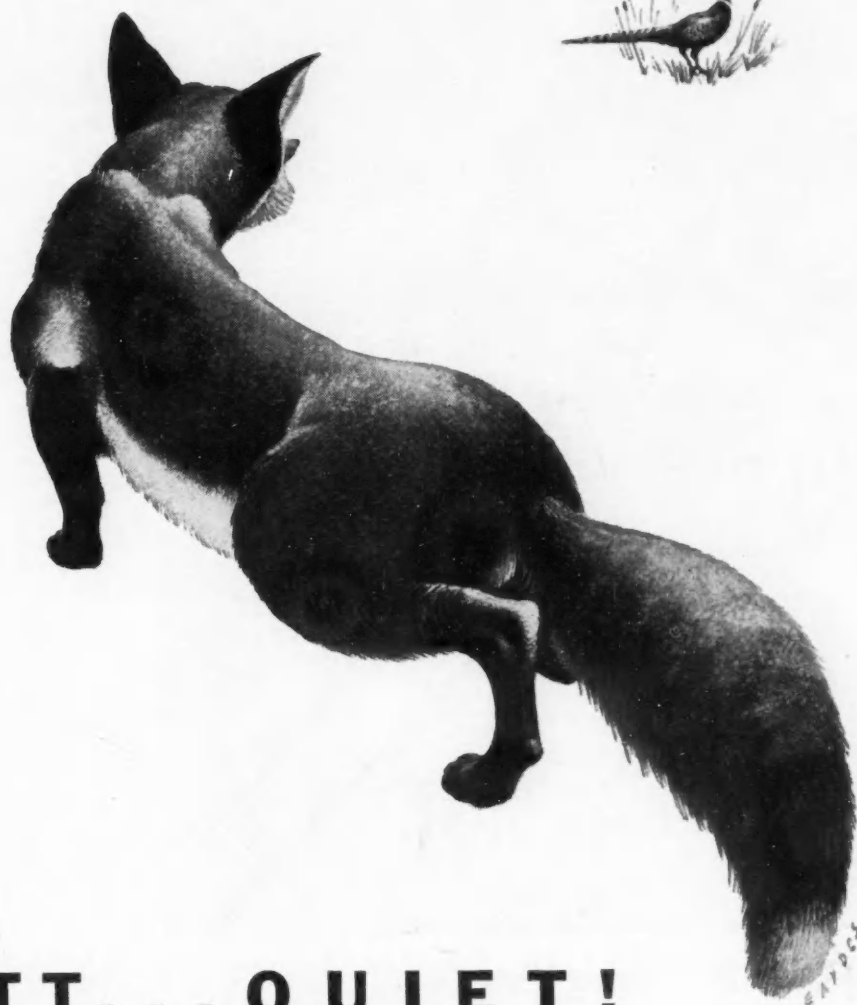
BOTH civilian and commercial flying are enjoying a great boom. This can be realized by noting that before the war there were 22,000 civilian planes and 350 commercial ships. There are now, less than a year after the end of the war, 30,000 planes and 500 commercial ships. About 50,000 planes are now on order, although only $\frac{1}{2}$ this number will be produced in 1946 and 1947; this output will double the present number of planes. Compare this figure with the best prewar year, in which 6344 civilian airplanes were manufactured.

Operation of one million personal planes in the United States by the end of the first postwar decade is entirely feasible; studies show that approximately 2,800,000 families, or $\frac{1}{4}$ of the number expected to be in the \$5,000-or-over income bracket, will be able easily to afford airplanes. Under proper conditions, the postwar expansion of airplane use may rival the rate of expansion of automobile use in that industry's infancy.

Editors of country newspapers, in answer to a survey by the American Press, predict that rural America will purchase 500,000 planes within five years. Predicating their estimate upon a wide availability of landing fields, 91% of the editors reported either that an airpark already was available within ten miles of town or that plans for one were already under way. Farmers, according to the editors, will use the planes for flying baby chicks to market, crop dusting, herding and locating cattle, hunting and fishing and "just flying."

Estimates of the number of planes by 1955 by CAA, WPB, and the American press vary from 400,000 to over 1 million.

Who will fly these planes is answered by the growing number of licensed pilots. The



HYATT... QUIET!

A rhythmic definition of motor vehicles in motion as the miles click off smoothly—dependably—quietly on Hyatt Roller Bearings.

In cars, trucks and buses by the millions Hyatt correctness of design—precision-perfect manufacture and ability to stand road shocks and strains, has been proved for a long time.

So when automotive engineers, year after year, write into their specifications "Hyatt Quiet" they know all will be well. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey; Detroit, Michigan.



HYATT QUIET ROLLER BEARINGS

number of pilots increased from a few thousand in 1939 to over 100,000 in one year as a result of the Civilian Pilot Training Program of the CAA. In 1945, 70,000 pilots' licenses were issued. Military pilots are now granted civilian pilot licenses on leaving the service after passing a written test on Civil Air Regulations. Since VJ Day ex-military pilots have been licensed at an average rate of 1000 per week.

Before the war there were 2500 airports, or an average of 10 planes per airport. Experts estimate that within the next two years there will be 4000 airports, including 900 surplus military fields which can easily ac-

commodate the 50,000 planes expected with an average of only 12 planes per airport.

Like your automobile, your future airplane will have to be relicensed annually and must be inspected at regular periods. Planes will have periodic inspection after every 100 hr flying time: this job will be done by 2000 maintenance inspectors. It is expected that each plane will have a major engine overhaul every 500 to 1000 hours including the lubricating system, hydraulic lifters, and so on. Your plane will use compounded oils and low lead gasoline, and will be lubricated by standard lubrication charts of major oil companies.

The major factor in cost is the amount of usage to which the plane is put. Although in the past it was usually cheaper to rent a plane, cost calculations show that it will in the future probably be much more economical to own your own plane.

Automatic Transmissions Spur Converter Studies

Excerpts from paper

by R. J. MILLER
Bendix Aviation Corp.

■ Annual Meeting, Jan. 9

(Paper entitled "Torque Converter")

PRESENT demand for automatic transmissions by bus and passenger car manufacturers is compelling automotive engineers to familiarize themselves with the hydraulic torque converter and its present and potential applications in the field. Although the solution to many manufacturing and functional problems will be costly in time, effort, and money, it only remains for the automotive industry to recognize the torque converter as an element of the automatic transmission. Competitive spirit of modern industry will do the rest.

A torque converter is ideal as a load starting device, but its efficiency is too low for continuous operation where 1:1 torque ratio is demanded. Efforts made to construct a single unit to behave as a torque converter during periods of high torque requirements, and as a fluid coupling when the torque demand falls off, have not been successful in meeting direct drive requirements. If designed to operate with a specific engine, the torque converter would be too small to function as a fluid coupling, and the resulting inefficiency and heat rejection during high speed operation would prohibit its use.

For this reason, in most bus applications the torque converter is mechanically locked out of the circuit by a friction clutch after the converter has gone through its torque multiplication range and the vehicle is in motion.

In its application to the passenger car, the torque converter alone will not suffice. Of necessity a mechanical reverse gear must be employed behind the converter, and more than likely a coasting gear, for in some states it is required by law. Road tests indicate that to accelerate the vehicle satisfactorily, the torque converter must be capable of producing a torque multiplication of around 3.5 or better at stall.

This may seem high, as it means greater acceleration, which at first may appear objectionable. However, the cushioning effect of the hydraulic drive and the fact that maximum stall torque ratio is available only under wide open throttle conditions results in smooth and even acceleration that outperforms any gear system. After the car has been accelerated under full throttle operation to the speed where the converter has reached the clutch point, the converter should automatically be locked out of the circuit.

Direct drive operation can be secured in the conventional manner by employing governors, and this system will serve to disen-

Ingenious New Technical Methods

To Help You with Your
Reconversion Problems



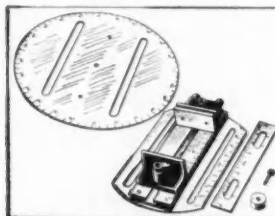
New, Simplified Drill Press Vise, Speeds Up Drilling, Spacing, Milling

Designed to be used with a drill press table having either parallel or radial slots, the New UNI-VISE drill press vise, with guide bar and protractor disc, speeds up and simplifies drilling, layout and spacing work in straight lines, radial or circular. With two movable jaws, vise has universal movement without swinging table or head of drill press to locate exact position of work. Operator thus adjusts work quickly for accurate registration.

Guide Bar facilitates drilling holes in a straight line. With a straight edge and a lineal scale on surface, it registers with lineal scale of vise. Protractor disc, for drilling holes accurately in a circle, has parallel slots registering with parallel slots in base of vise, and a removable means to pivot complete unit on table of drill press.

Accurate work can always best be done by attentive operators. That's why many factories urge workers to chew gum. The chewing action helps relieve monotony—helps keep workers alert, thus aiding them to do a better job with greater ease and safety. And workers can chew Wrigley's Spearmint Gum right on the job—even when hands are busy.

You can get complete information from Spiral Mfg. Corp.
3612-26 N. Kilbourn Ave., Chicago 41, Ill.



AA-83

ENGINEERING DATA ON THE NEW Firestone DELUXE CHAMPION TIRE

MODERN cars are so comfortable, so quiet, so smooth riding, so easy handling, and so high powered that they invite fast driving over all kinds of roads in all kinds of weather. Such performance is possible with safety only if the tires are adequate for the job. The tires propel and support the car; they keep it on the road; they start and stop it; and they cushion it against shocks and destructive vibration. If the car manufacturer puts more horsepower in the engine, it is the tires that have to absorb the increased power and performance.

Firestone is already in production on tires suitable for the 1947 models with a brand new type which excels any of our earlier designs in every detail. The tire is new from bead to tread. Our tire engineers' reports summarize as follows:

Treadwear

We tested 6-rib, 7-rib, 8-rib, and 9-rib designs in different tread widths and tread flatnesses. The 8-rib design showed treadwear improvement between 20% and 30%.

NOTE: 7-rib tread is used in 5.50-15 and smaller sizes.

Cord Body Strength

We tested various forms of rayon cord versus cotton cord and found rayon gave added ruggedness and body strength with up to 55% improvement. This, of course, was very necessary in order to have a tire body that would be serviceable for the increased treadwear mileage in the tire and also to accommodate the harder driving of which cars are capable.

NOTE: At present the limitations on rayon production restrict the use of this type of cord to 6.50 and larger sizes.

Traction and Stopping Ability

An increase of about one-third in the number of traction elements due to the increase in the number of ribs substantially improved the safety control of the tires on both wet pavements and to a noticeable degree on icy pavements.

Car Handling

Driver reaction on the new tires is all on the plus side considering general stability, cornering, crosswind operation, handling on gravel, high speed driving, etc.



Tire Operating Temperatures

Rayon cord makes tires run in the neighborhood of 20° cooler than corresponding cotton tires. Cooler running tires are particularly important in the avoidance of blowouts throughout the long life of the tires. The rayon construction allows slightly thinner overall gauge for the different parts of the tires which also contributes to cooler running.

Tire Noises

All phases of tire noises are reduced. This includes growl on asphalt, rumble on cobble and brick pavements, thump on expansion joints, squeals around corners, etc. Furthermore the characteristics of the tread design maintain quieter aspects throughout the life of the tires.

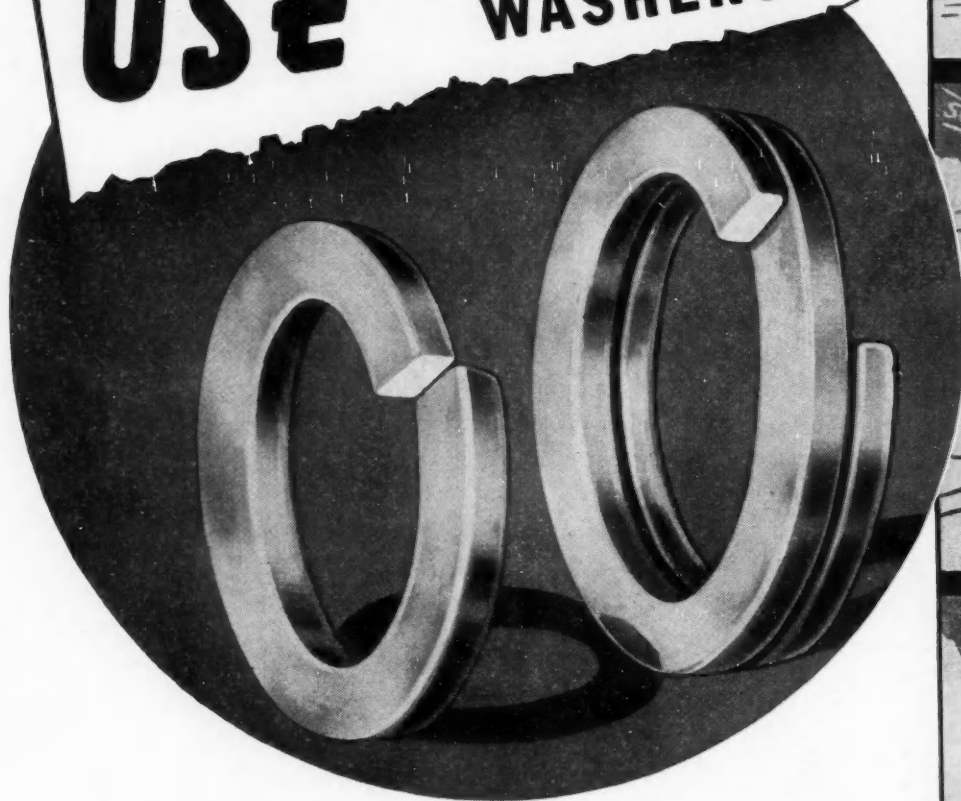
Riding Comfort

The seven grooves and eight ribs coupled with slightly thinner overall body thickness contribute to a softer riding tire so that there is a noticeable improvement in riding comfort comparisons. Our new tire with a butyl tube and mounted on a wide base rim is really a great step forward in tire safety and mileage.

THE FIRESTONE TIRE & RUBBER CO.
AKRON, OHIO

Copyright, 1946, The Firestone Tire & Rubber Co.

USE SPRING LOCK WASHERS



TO SAFEGUARD AGAINST VIBRATION

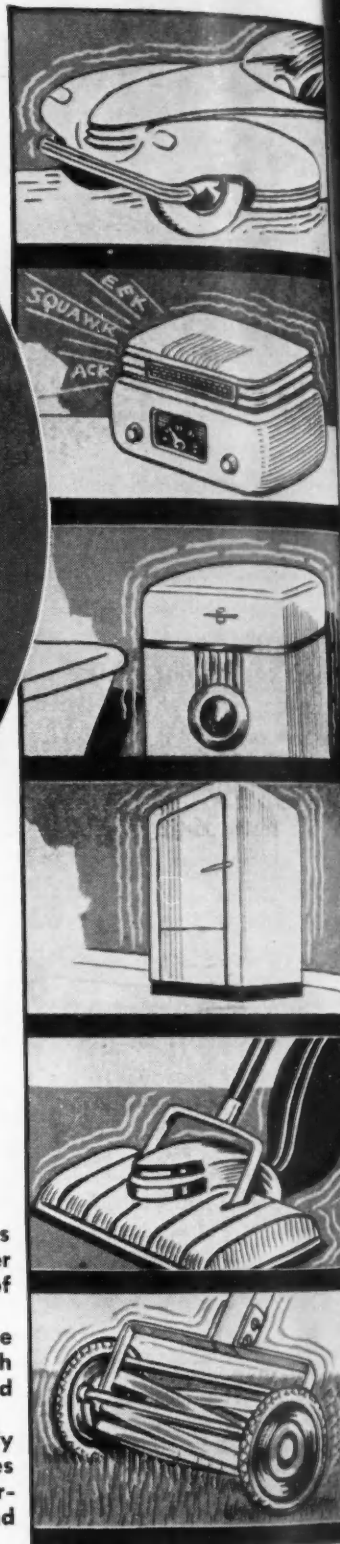
Refrigerators . . . washing machines . . . automobiles . . . in every mechanical and electrical device vibration is a constant threat to efficient operation. Vibration caused by stretching of bolt or screw, rusting or corrosion, not only weakens the original spot, but ultimately other parts of the unit as well.

Safeguard your products against unnecessary vibration with spring lock washers on every assembly. The exclusive "Controlled Tension" built into

every Diamond G Lock Washer assures positive, unfailing spring tension under all conditions . . . plus the advantage of a thrust washer bearing.

Diamond G Lock Washers permit the full tightening of bolt and screw with assurance against vibration, shock and excessive wear.

Stop vibration before it starts. Specify Diamond G Lock Washers. Deliveries are quick, prices right, quality unsurpassed. Write for free booklet, and ASA and SAE specifications.



GEORGE K. GARRETT CO., INC.

1421 CHESTNUT STREET, PHILADELPHIA 2, PA.

MANUFACTURERS OF

DIAMOND  PRODUCTS

LOCK WASHERS • • FLAT WASHERS • • STAMPINGS • • SPRINGS • • HOSE CLAMPS • • SNAP AND RETAINER RINGS

page the direct drive when the car has reached a predetermined low speed so that the converter may again function. Coasting gear for hill descent or for long upgrade pulls requiring torque multiplication and the reverse gear are manually selected. A torque converter as described in this or similar systems allows the engineer to take advantage of the good points of the torque converter and to overcome the deficiencies in an economical manner.

Most converters have been made of extruded vane sections screwed or riveted into place. Both straight, or two-dimensional, and twisted, or three-dimensional, vanes are being considered. Advanced studies made in precision casting the vanes integral with the housing and shroud have been very successful, and point a way to economically producing either type, in small or relatively large quantities. Both plaster methods and pattern methods of precision casting make it possible to obtain conventional tolerances, configurations, and surface finishes that will meet requirements with little hand work. The most successful answer to low cost production will be fully stamped sheet metal vane and housing; but this can only be achieved with high quantity production.

Spark Plug Study Bettters Performance

Digest of paper

by R. M. WARD

Champion Spark Plug Co.

■ Northwest, Jan. 4

(Paper entitled "Spark Plugs")

GREATER understanding of the spark plug function and its relation to the engine will increase operating efficiency of the vehicle and reduce maintenance costs, Mr. Ward demonstrated.

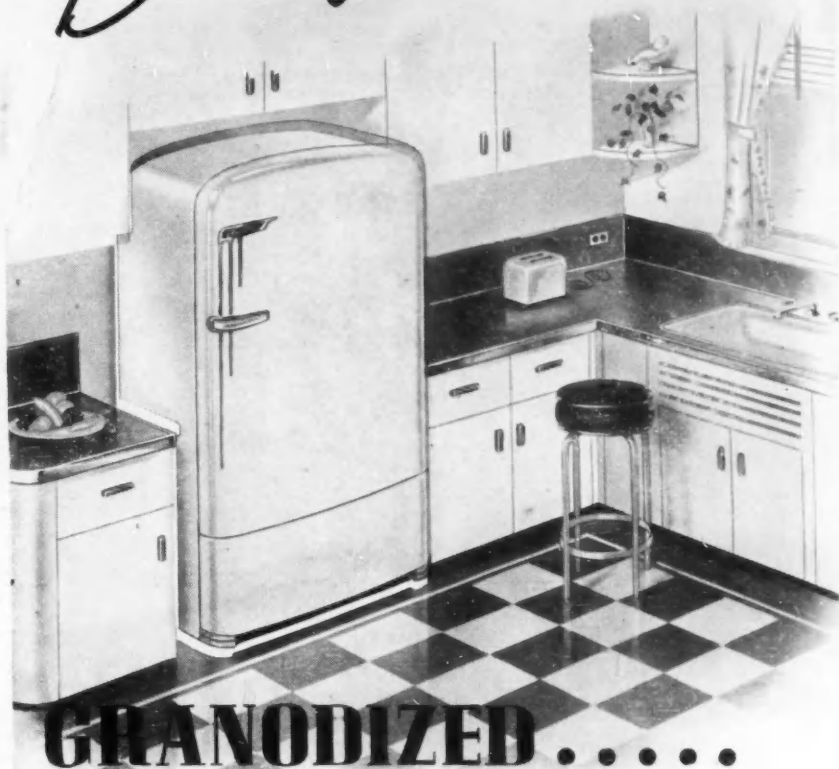
To analyze spark plug problems properly, it is first necessary to understand how it works. When the electric current arrives at the end of the plug center electrode to start the combustion cycle, it does not jump the gap as is sometimes supposed. It must wait temporarily at this point, due to the combined resistance of the gap and the compression pressure. In the presence of this resistance, the electric current harnesses the gas mixture in the gap area to provide the conductive vehicle necessary to cross the gap.

Ionization takes place during this action whereby the current creates its own bridge to the side electrode by arranging the ions of the gaseous elements present in the gas mixture. Great friction is generated by this action and a showering of sparks and a veritable bombardment of the mixture elements occurs; and the further phenomenon of burning takes place in igniting the compressed mixture. At this point the spark plug releases the great store of energy in the cylinder charge.

By their operation in this "chemical factory," spark plugs should be considered expendable in the very nature of the work they must do. They cannot function indefinitely and their cycle of service must be renewed with fresh elements at regular intervals if the engine is to be dependable and efficient. There are, however, numerous con-

THE **CHARM** OF A

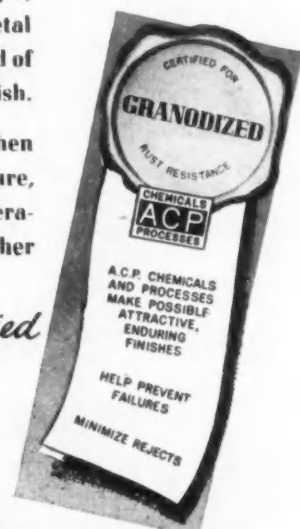
Beautiful Finish



Spray Granodizing metal surfaces assures a durable, lustrous paint finish. The smooth, tight, hard, phosphate coating anchors paint to the metal for permanent protection; preventing the spread of rust from accidental injury to the paint finish.

The appealing beauty of the paint finish when applied to a Granodized surface will endure, whether it be the finish of automobile, refrigerator, washing-machine, kitchen cabinet or other products constructed of sheet metal.

PAINT DURABILITY IS *Certified*
WHEN METAL SURFACES ARE
GRANODIZED



MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

ditions that will shorten the life of the plug and reduce engine efficiency. When cases arise where it is necessary to handle vexing or chronic spark plug problems, it will be found that these four factors are involved:

1. Malfunctioning of the engine due to mechanical or other deficiencies;
2. The engine's operating characteristics are not within its normal operating range;
3. The installation and gap setting of the plug may be incorrect, and
4. The wrong type or quality of plug is in use.

Malfunctioning of the engine in any of the phases of the cycle of operation can cause plug fouling or burning. For example, excessive oil can be permitted to pass into the combustion chamber pending full warm-up. This results in an abundance of elements in the mixture causing deposits of fouling matter on the spark-plug insulator which had not reached proper operating temperature before subsequent engine use. The second condition, operation outside of the normal range, may give rise to high temperatures for which the plugs are not suited and burning or pre-ignition dangers may follow.

Gap Setting Important

Troubles due to incorrectly shaped or spaced gaps will manifest themselves in the form of poor idling, acceleration, or full power performance. Gaps can be set between the maximum and minimum settings, according to the type of engine operation desired. For example, if the operation was consistently at low power and idling, the maximum or widest practical setting would be desirable to gain engine smoothness. On the other hand, for operation with long periods of sustained power, the closest possible setting commensurate with idling requirements would be preferable to secure the longest gap life before resetting would be necessary.

To avoid malfunctions attributed to the fourth factor in analysis of spark plug problems, attention must be given to the selection of the proper type of plug for the particular engine in question. Where high temperatures are encountered, a cool operating plug must be provided to avoid plug burning or pre-ignition; in the opposite extreme, a hot operating spark plug must be provided to prevent fouling dangers.

A cold operating plug has a relatively short insulator projection exposed to the combustion chamber which affords a fast transfer of heat from the insulator firing end to the cooling medium. This assists the plug in operating at a low enough temperature to avoid burning and pre-ignition and still run hot enough to prevent fouling.

The relatively long insulator projection of a hot operating plug delays the passage of heat so as to retain a temperature balance within the insulator to burn off the fouling matter which may have a tendency to form from low engine operating temperature.

Properly operating spark plugs can save gasoline, Mr. Ward demonstrated. Since the electric current travels to the gap by means of the center electrode coming out of the insulator, carbon deposits and other conductive materials coated on the insulator form conductive paths whereby part of the electric current can easily leak to the ground without performing its function in assisting to ignite the mixture. Reduction of spark intensity hampers proper ignition of the compressed gas and burning is slow, sluggish, and incomplete.

When the spark at the gap is weak, the piston is compelled to move downward on its power stroke prematurely in ratio to the burning of the gasoline, with only a partial power development occasioning its travel with the burning mixture only partially expanded. Thus, the piston starts upward on its exhaust stroke, the exhaust valve opens, and the valuable heat units and power qualities of the still-burning gasoline are expelled from the cylinder and wasted through the exhaust system. In such cases, the back pressure exercised on the piston moving upward by the still expanding mixture further reduces engine efficiency. The engine requires a further opening of the throttle for added volumes of gasoline to overcome the braking action, so as to provide the power that should have come in the proper ignition of the original gas mixture provided.

One of the most interesting things about a spark plug, Mr. Ward concluded, is that a portion of the plug operates inside the inferno of the combustion chamber, and another portion operates outside the engine—a difficult assignment for any device subjected to such extremities.



FOR SPARK PLUG PORCELAINS

Past performance in millions of internal combustion engines has proved the excellence of ZIRCON as the porcelain for spark plug bodies.

ZIRCON electrical porcelains represent ease of manufacture at low cost . . . and excellent overall properties are obtained. ZIRCON porcelains offer high resistance to mechanical

and thermal shock because of their high mechanical strength and low thermal expansion.

Wide maturing range at normal electrical porcelain firings—dense bodies of high dielectric strength and high heat conductivity are obtainable when you specify OREFRACTION ZIRCON as the refractory in your Spark Plugs.

OREFRACTION, INC., 7505 Meade St., Pittsburgh 8, Pa.



Trade Mark
U. S. Pat. Office

L. R.

■ SAE J

Printed
56th & C

Editor
29 W
New
Long

N

Easte

West
3-210 Ge

■ SAE

29 W
New
Tel:

■ WES

714
Los
E. I

■ DET

(for Tec
800
Tel
R.

The Socie
er opinion
of its me

Copyright
gineers,